THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXIX. No. 1759.] LONDON, JANUARY 26, 1897. [49TH YEAR. PRICE 6d.

TUBES AND FITTINGS
FOR
GAS, STEAM, WATER,
AND ALL PURPOSES,
ALSO
COILS OF EVERY SIZE AND SHAPE.

Apply to the Original Firm of
JOHN BROTHERTON
LIMITED,
Imperial Tube Works, Monmore Green,
WOLVERHAMPTON.
ESTABLISHED 1861.

Lanemark Coal Co.,
LIMITED.
LANEMARK CANNEL AND GAS COALS.
Quotations and Analysis on Application to
LANEMARK COLLIERY,
NEW CUMNOCK, N.B.
Shipping Ports: All the principal Scotch Ports.

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.
THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores, for Gas and Water Works.
WORKS:
ORMSIDE STREET, OLD KENT ROAD,
LONDON.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.
Prices and Analysis of all the Scotch Cannels on Application.

CARLESS, CAPEL & LEONARD,
HOPE CHEMICAL WORKS, HACKNEY WICK, LONDON, N.E.,
And at Pharos Works, Hackney Wick.
NAPHTHA AND GASOLINE DISTILLERS AND PETROLEUM IMPORTERS,
Specially distil Carburine Spirit, specific gravity ·680, or of any other grade suitable for Enriching Gas; also Gas Oil best adapted for injecting into the Retorts, as in the Herring Process.
Importers of Petroleum for Carburetting Water Gas, or for Manufacturing Oil Gas. Distillers of Pentane, Petroleum Ether, and Naphtha for clearing the pipes of Naphthaline, &c.
Samples and Prices may be had on application.

4,444
"MELDRUM" FURNACES
MADE TO DECEMBER 16th, 1896.
No Gas-Works should be without. WRITE FOR CATALOGUE & TESTIMONIALS.
MELDRUM BROS., ATLANTIC WORKS, **MANCHESTER,**
Also at London, Leeds, Birmingham, Liverpool, Newcastle, and Glasgow.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER & BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM

(ESTABLISHED 1765).

MANUFACTURER OF TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, and all kinds of GAS APPARATUS,

Wrought-Iron Roofs, Bridges, Girders, &c.,

Steam, Hot Water, and Range Boilers, Tanks, Cisterns, Boats, and all kinds of Wrought-Iron Work.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES SUPPLIED ON APPLICATION.

EDWARD COCKEY & SONS, LIMITED,

ENGINEERS & CONTRACTORS FOR GAS-WORKS,

MAKERS OF FISH AND SMITH'S PATENT (NO. 5108) OVERFLOWS FOR REGULATING THE SEAL IN GAS-WASHERS, &c.

TELEGRAPHIC ADDRESS: "COCKEYS FROME."

Improved Dry-Faced Centre Valves for Working either One, Two, Three, or Four Purifiers at one time; giving an increase of Purifying Area above that obtainable with ordinary Centre Valves of 33⅓ per Cent.

PRICES ON APPLICATION TO THE SOLE MAKERS.

THE IRON-WORKS, FROME SELWOOD, SOMERSET.

London Office: BRIDGE HOUSE, 181, QUEEN VICTORIA STREET, E.C. *BALE AND HARDY, Agents.*

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

—11 MEDALS.—

MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

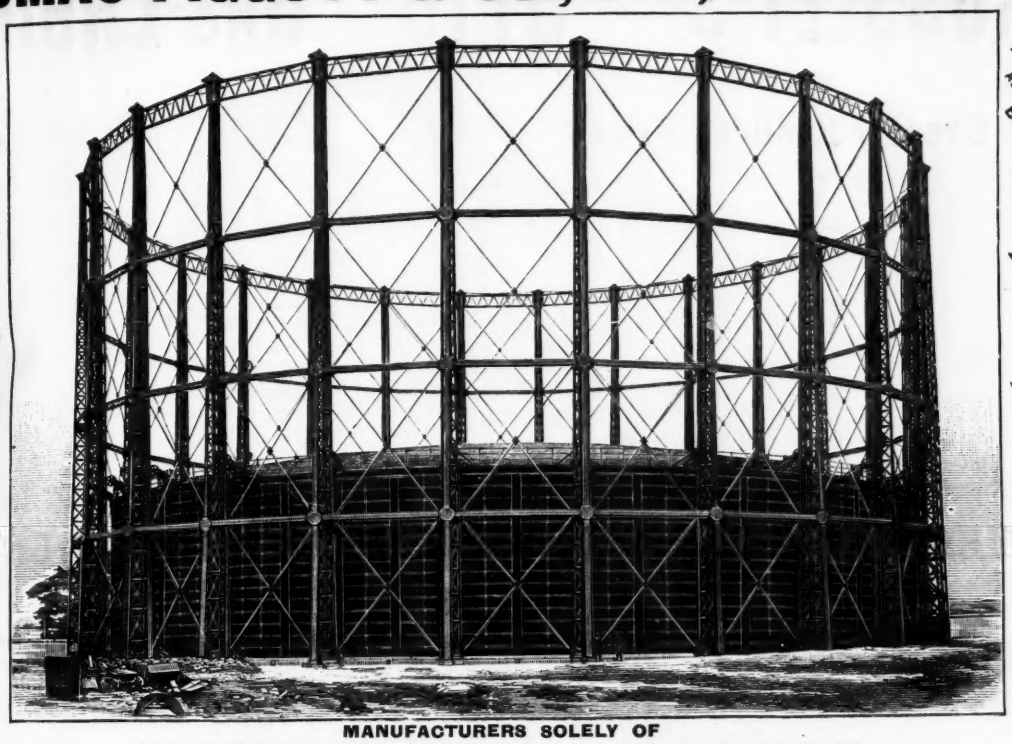
SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

LONDON:	MANCHESTER:	BIRMINGHAM:	LEEDS:
108, Southwark Street.	33, King Street West.	114, Colmore Row.	6, Mark Lane, New Briggate.

THOMAS PIGGOTT & CO., LTD., BIRMINGHAM.

LONDON OFFICE: ST. THOMAS APOSTLE, E.C.

GAS PLANTS, BOILERS, ENGINES, PUMPS, ROOFS, RETORT FITTINGS, ETC.



TELEGRAPHIC ADDRESS: ATLAS BIRMINGHAM

WELDED & RIVETED PIPES, FOUL MAINS, RETORT LIDS, WROT & CAST TANKS, PURIFIERS.

MANUFACTURERS SOLELY OF

HUMPHREYS & GLASGOW'S

PATENT CARBURETTED WATER-GAS PLANT.

INSTALLATIONS have already been supplied, and are in operation at the following Gas-Works: COPENHAGEN, BELFAST, GLASGOW, BRUSSELS, SANTIAGO, SWANSEA, TOTTENHAM, LIVERPOOL, BRIGHTON, BATH, PRESTON, SOUTHPORT, NEW YORK, NEWBURGH (N.Y.), NEWBURGH (Second Contract), HOYLAKE; and are in course of erection at: BELFAST (Second Contract), EDINBURGH, TOTTENHAM, WINCHESTER, MANCHESTER, BRUSSELS (Second Contract), ST. JOSEPH (MO.), HOLYOKE (MASS.), SHANGHAI, STOCKTON, STOCKPORT, NORWICH, GUILDFORD, SYRACUSE, BORDENTOWN, LEA BRIDGE, COVENTRY.

All Particulars from Patentees: 9, VICTORIA STREET, LONDON, S.W.

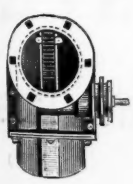
NEWTON, CHAMBERS, & CO., LIMITED,

THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

SLIDE VALVES, WITH RACK & PINION OR Internal or External SCREWS of all sizes.

GASHOLDERS, AND Gasholder Tanks.



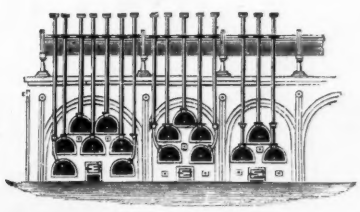
CAST-IRON RETORTS,

RETORT-BED FITTINGS,

And Retort-House Appliances

of every description,

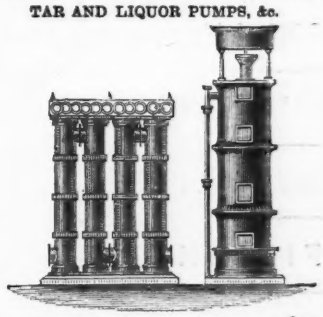
Iron Roofs, Columns, Girders, Floor Plates, Tools, &c.



WROUGHT AND CAST IRON

CONDENSERS, SCRUBBERS, & WASHERS,

TAR AND LIQUOR PUMPS, &c.



PATENT

CENTRE-VALVES

for working Purifiers,

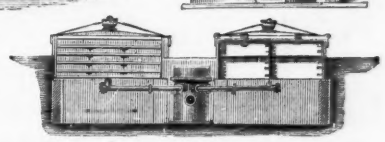
Also Bye-Pass & Stop Valves

PURIFIERS with Planed Joints,

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS, and SPECIALS.

WOOD GRIDS.

CAST AND WROUGHT IRON TANKS AND CISTERNS.



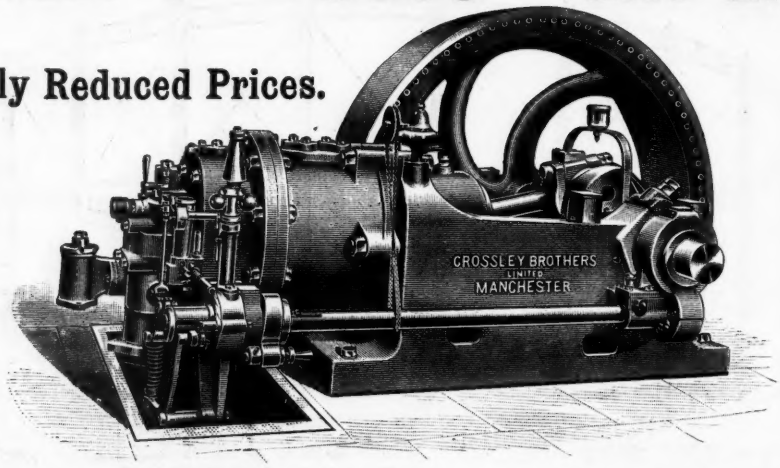
DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

CROSSLEY'S "OTTO" GAS-ENGINES

Greatly Reduced Prices.



REPRESENTS NEW TYPE 40-HORSE POWER NOMINAL HIGH-SPEED ELECTRIC-LIGHT ENGINE.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER.

HARRIS & PEARSON,

STOURBRIDGE, ENGLAND

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

GLAZED BRICKS AND PORCELAIN BATHS.

FALK, STADELMANN, & CO., LD.,

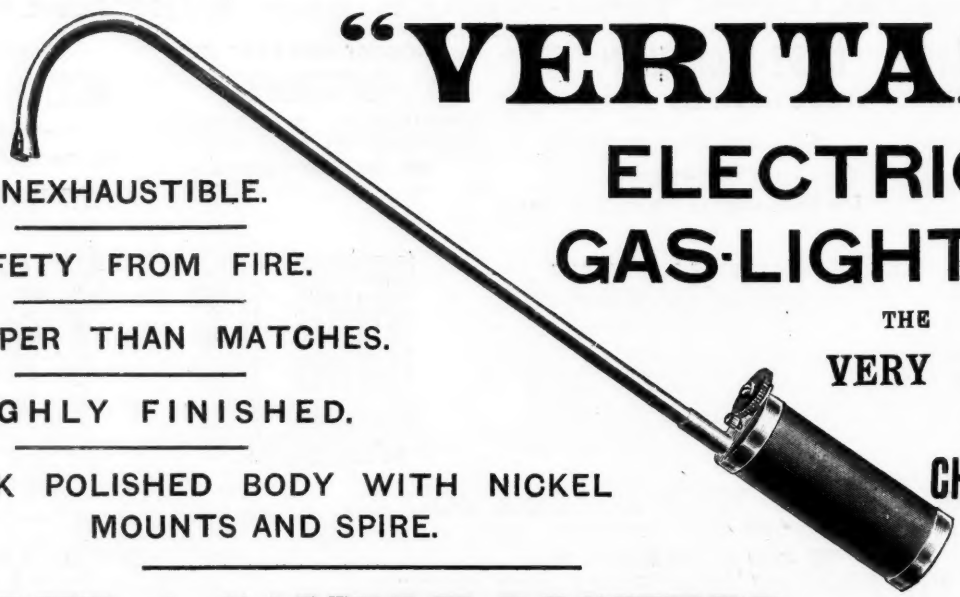
VERITAS LAMP WORKS,

83, 85, & 87, FARRINGDON ROAD, LONDON, E.C.

THE

"VERITAS"

ELECTRIC GAS-LIGHTER



INEXHAUSTIBLE.

SAFETY FROM FIRE.

CHEAPER THAN MATCHES.

HIGHLY FINISHED.

BLACK POLISHED BODY WITH NICKEL MOUNTS AND SPIRE.

THE VERY BEST AND CHEAPEST EVER OFFERED.

ORDER A SAMPLE LIGHTER.

ILLUSTRATED PRICE LIST OF ABOVE AND OF GAS-FITTINGS UPON APPLICATION.

INCANDESCENT GAS-LIGHT

(WELSBACH PATENTS).

Important Notice.

Large Reduction in Prices From March 2, 1896, Due to Colossal Sales, And Universal Adoption of the System.

THE GREATLY REDUCED CONSUMPTION OF GAS
Covers the Initial Cost of the Burners in less than SIX Months.

The Prices have been REDUCED as follows:—

The Ordinary "C" Burner, price 6/6
The "C" Bye-Pass Burner, „ 7/6

Prices of other Patterns Reduced Proportionately.

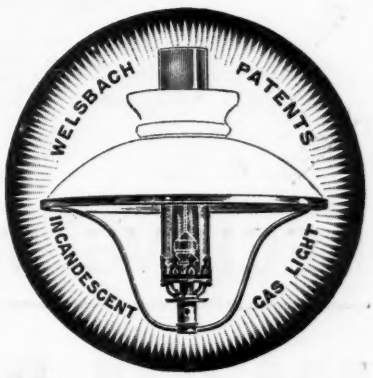
Special attention is called to

The "S" Bye-Pass Burner, price 7/6

which, with a consumption of 2¼ cubic feet of gas an hour, gives

A LIGHT OF 25 TO 30 CANDLE POWER.

This pattern is particularly recommended where it is desired to effect a large saving in gas rather than to effect a great increase in the light.



The attention of Gas Managers and Gas Engineers is called to this System of Lighting as one which tends to **Popularize the Use of Gas** as an Illuminant, owing to the following Advantages:—

Economy in Consumption of Gas, combined with High Illuminating Efficiency.
Freedom from Smoke, Dirt, and Flickering.
Greatly Reduced Heat.
The combination of High Lighting Power with DURABILITY can only be obtained by The Welsbach System.

The "Lancet" Special Analytical and Sanitary Commission, in an exhaustive report, pronounces the "Incandescent Gas-Light System" to be the **Healthiest, Best, and most Economical System of Gas Lighting.**

Suitable for every purpose of **Inside and Outside Lighting.**

FOR FURTHER PARTICULARS, APPLY TO

THE INCANDESCENT GAS-LIGHT CO., LTD.,

Palmer Street, Westminster, London, S.W.

W. J. JENKINS & CO.

GAS ENGINEERS AND IRONFOUNDERS,

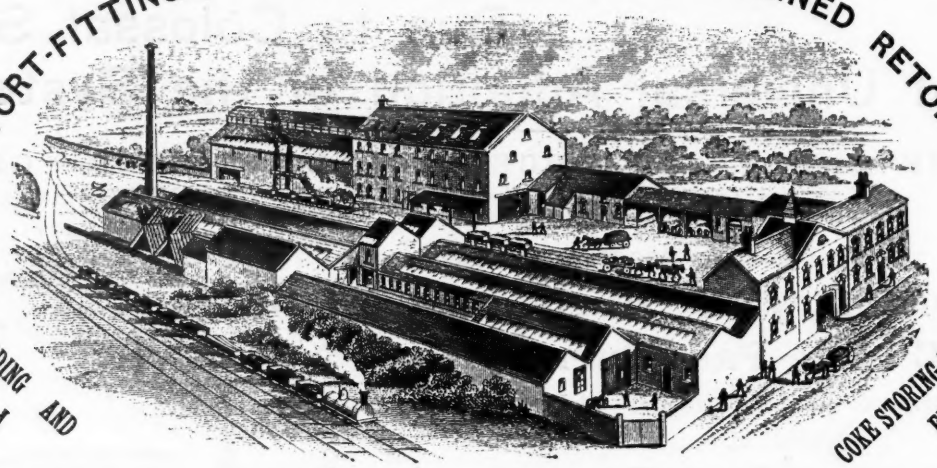
MAKERS OF ALL KINDS OF

PLANT AND MACHINERY FOR GAS-WORKS.

COAL-BREAKERS. COKE-SCREENS.

MOUTHPIECES. LIQUOR-TANKS.

RETORT-FITTINGS, REGENERATOR SETTINGS, INCLINED RETORTS.



COAL UNLOADING AND CONVEYING A SPECIALITY.

COKE STORING PLANT, ENGINES, EXHAUSTERS, VALVES.

BEEHIVE WORKS, **RETFORD,** NOTTS.

THE

MAXIM PATENT CARBURETTOR

FOR ENRICHING GAS IN BULK.

Over 50 Maxim Patent Carburettors have now been fixed, capable of enriching

650,000,000

CUBIC FEET OF GAS PER DAY.

Among the Companies supplied are The Gaslight and Coke Company, the South Metropolitan Gas Company, Birmingham Corporation, Manchester Corporation, Rochdale Corporation, Bristol Gas Company, and many other Works, both large and small, where they have been working in some instances for the past **FOUR YEARS.**

More Gas and saleable Coke per ton of Coal Carbonized is produced; saving Capital, Labour, Fuel, Wear and Tear, &c.

The Enrichment is **INSTANTANEOUS** and **PERMANENT.**

The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.

SOLE AGENTS FOR REDWOOD & CLOWES' INFLAMMABLE VAPOUR & GAS DETECTORS.

Dealers in Carburine and all other Naphthas for the Enrichment of Gas.

FOR PRICES AND FULL PARTICULARS, APPLY TO

THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,

18, DEVONSHIRE STREET, BISHOPSGATE, LONDON, E.C.

EXCHANGE TELEPHONE: NO. 1756 BANK.

J. & H. ROBUS,

TELEGRAPHIC ADDRESS "ROBUSTNESS, LONDON."

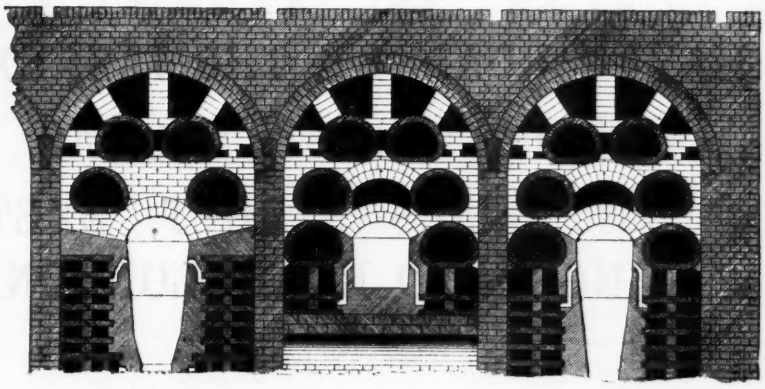
ENGINEERS & CONTRACTORS,

20, BUCKLERSBURY, LONDON, E.C.

Complete Erection or otherwise.

Gasholders, Tanks, and Reservoirs of all sizes.

Gas and Water Main Laying a Speciality.



Retort Setting a "Speciality." Inclined or Horizontal Settings (with or without Regenerative or Generative Furnaces) of the most approved and Economical Designs.

ESTIMATES SUBMITTED FOR

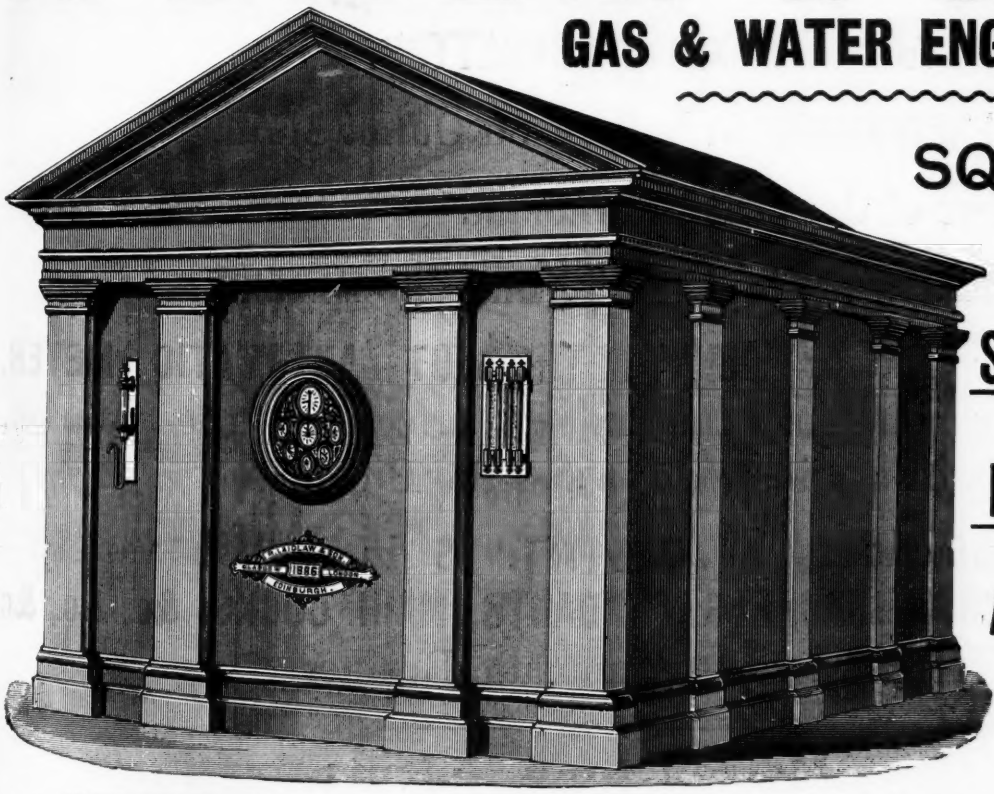
Gas and Water Work of Every Description.

Contractors to H.M. Government.

See Illustrated Advertisement in last week's "JOURNAL" (p. 111).

R. LAIDLAW & SON

GAS & WATER ENGINEERS.



SQUARE

(OR ROUND)

STATION

METERS

ALL SIZES.

SIMON SQUARE WORKS, EDINBURGH. | ALLIANCE FOUNDRY, GLASGOW. | 6, LITTLE BUSH LANE, LONDON.

WILLEY & CO., GAS ENGINEERS,

CONTRACTORS TO THE GOVERNMENT,

LONDON & EXETER.

Offices: HAVEN ROAD, ST. THOMAS, EXETER.

Engineering Works & Brass Foundries: ST. THOMAS, EXETER.

Meter Factories & Works: JAMES STREET, EXETER; and 248, KINGSLAND ROAD, LONDON.

LATEST SPECIALITIES.

WATER-GAS APPARATUS—A Model Plant in course of erection at their Exeter Engineering Works. Continuous Process; the best Results yet attainable.

COLUMNLESS GASHOLDERS—Makers of Gadd & Mason's Patent System.

Agents for the **MAXIM CARBURETTOR.**

GAS ENRICHMENT in bulk or on Outlet Main.

Makers of the **LIVESEY WASHER.**

Manufacturers of **WET AND DRY GAS-METERS.**

Their Patent **PENNY-IN-THE-SLOT AUTOMATIC METER,** admittedly one of the most perfect in the Market. Thousands in use in London and the Provinces.

Manufacturers of **GAS-FITTINGS** in endless variety—**CHANDELIERS, BRACKETS, PENDANTS, MAIN COCKS, &c., &c., &c. SPECIAL FITTINGS** for the Automatic Business.

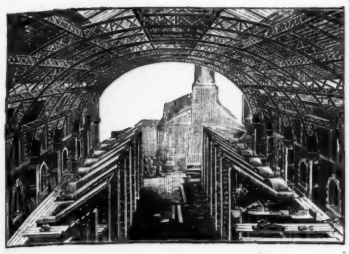
Metropolitan Agent:

FRANK ACLAND, M.Inst.C.E., M.Inst.M.E., 76, Cheapside, E.C.

Telegraphic Address: "WILLEY, EXETER." Telephone 132. Established over 30 Years.

W. C. HOLMES & CO.

IRONFOUNDERS AND CONTRACTORS.

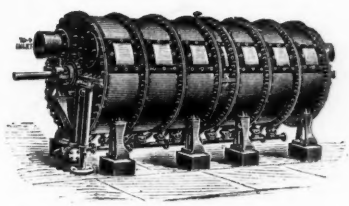


Makers of
GAS & CHEMICAL
PLANT.

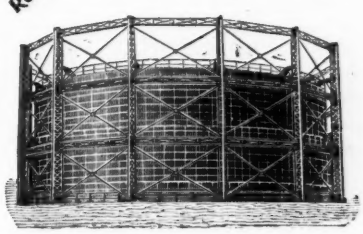
Telegrams:
"HOLMES, HUDDERSFIELD."

Improved
PATENT SCRUBBER-WASHERS,
All sizes,
From 50,000 to 5,000,000 Cubic Feet of Gas per day.
Results unrivalled. Send for Particulars and Prices.

MALLEABLE
and all Kinds of
CASTINGS.



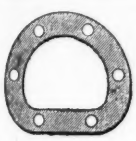
GASHOLDERS of Improved Construction and of all Sizes.
ROOFS, BRIDGES, TANKS, GIRDERS.



Improved
BYE-PASS and
CENTRE-VALVES,
GOVERNORS,
and METERS.

Rotary or Pump
EXHAUSTERS.

80, CANNON STREET, LONDON,
AND
WHITESTONE IRON WORKS, HUDDERSFIELD.



LARGEST MANUFACTURERS IN THE UNITED KINGDOM OF GAS-RETORTS,

HORIZONTAL or INCLINED; also Makers of
SEGMENTAL RETORTS of all SECTIONS.

PATENTEES OF
MACHINE-FLANGED RETORTS

B. GIBBONS, JUNR., LTD.

DIBDALE WORKS DUDLEY.

TELEPHONE
No. 8010.

Telegraphic
Address:
"MACHINE, LOWER GORNAL"

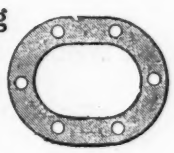
SPECIAL BRICKS and
BLOCKS of every description
for GENERATOR and REGENERATOR
FURNACES.

"ABC" Code and UNICODE used
for Telegrams and Cablegrams.

Large Stocks of Bricks of all sizes, Burrs, Boiler Seating
Blocks and Covers, Plain and Rebated Tiles, &c., &c.

RETORTS and other FIRE-CLAY GOODS CAREFULLY PACKED for EXPORT.

FOREIGN and HOME COPIES of ILLUSTRATED CATALOGUES on Application.



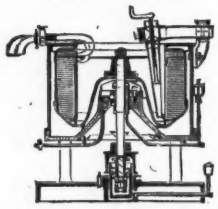
KIRKHAM, HULETT, & CHANDLER, LD.

3 & 4, PALACE CHAMBERS, BRIDGE STREET, WESTMINSTER, S.W.

MARSHALL'S PATENT COMBINED BATTERY CONDENSER AND SCRUBBER.

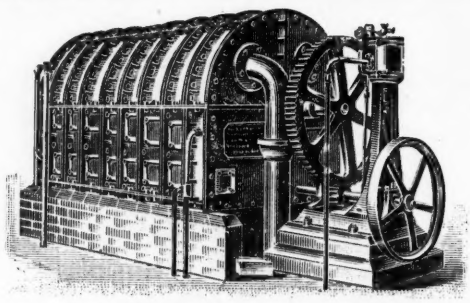
Extract from letter from Mr. Winstanley, of Coventry: 'The Condensers you erected for us have been in use some time, and are working very satisfactorily.'

BURMEISTER AND WAIN'S TAR-SEPARATOR.



EXTRACTS OVER 90 PER CENT. OF AMMONIACAL LIQUOR FROM TAR.

PATENT "STANDARD" WASHER-SCRUBBER.

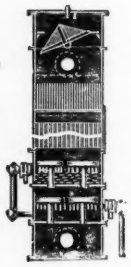


OVER 530 MACHINES

In use and in course of Construction.

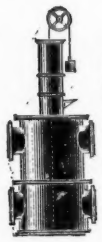
They extract all the Ammonia and a large proportion of Carbonic Acid and Sulphuretted Hydrogen.

PATENT "STANDARD" VERTICAL SCRUBBER AND TAR-EXTRACTOR.



SUITABLE FOR SMALL WORKS WITHOUT AVAILABLE MOTIVE POWER FOR MECHANICAL WASHERS.

MARSHALL'S PATENT TAR EXTRACTOR AND WASHER.



Extract from letter from the Late Mr. Jabez Church: "The Marshall Patent Tar-Extractor has given very satisfactory results."

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

Midland District Office: PRINCE'S CHAMBERS, 6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.

TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.

London District Office: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.

TELEGRAPHIC ADDRESS: "PARKER LONDON."

R. DEMPSTER & SONS,

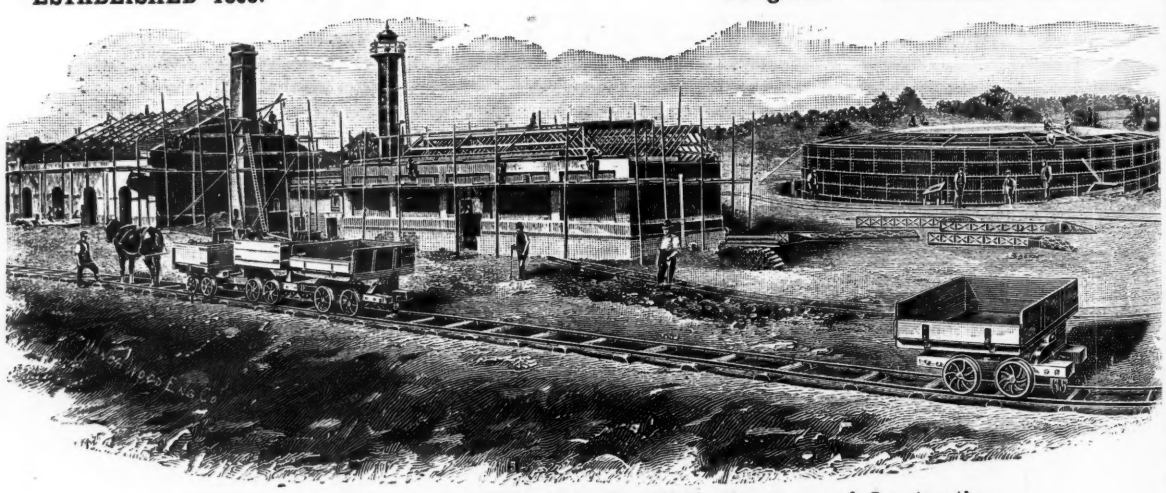
LIMITED,

GAS ENGINEERS and CONTRACTORS,

ELLAND, YORKS.

ESTABLISHED 1885.

Telegrams: "DEMPSTER, ELLAND."



Engraved from Photograph of Complete Gas-Works in course of Construction.

The WHOLE of the Apparatus, Foundations, Retort Work, Buildings, and Levelling of Site have been executed by our own Workmen. No Sub-Contracts.

Estimates and Illustrations for complete Works, or for any detailed parts, supplied gratis on application.
Tenders given for all kinds of Structural Ironwork.

ARDEN HILL & CO.,

GAS ENGINEERS,

BIRMINGHAM.

No. 1080.

"THE ERA."

(Registered.)

A New Fire, with Circular Front, for this Season.

Has a perfect arrangement to utilize all Products of Combustion.

SPECIALLY MADE FOR HIRING-OUT PURPOSES.

No.	Height. Inches.	Width. Inches.	Width of Fire. Inches.	Price, Best Stove Enamel.
1080	29	20	8½	50s.
1082	30½	22½	10	60s.
1084	31½	25½	13	70s.

NOTE.—Prices include New Duplex Burner, Two Brass Lever Taps, and Fittings all complete, which can be had either right or left hand.

NICKEL PLATED TRIVETS . . . . . 2s. EXTRA.

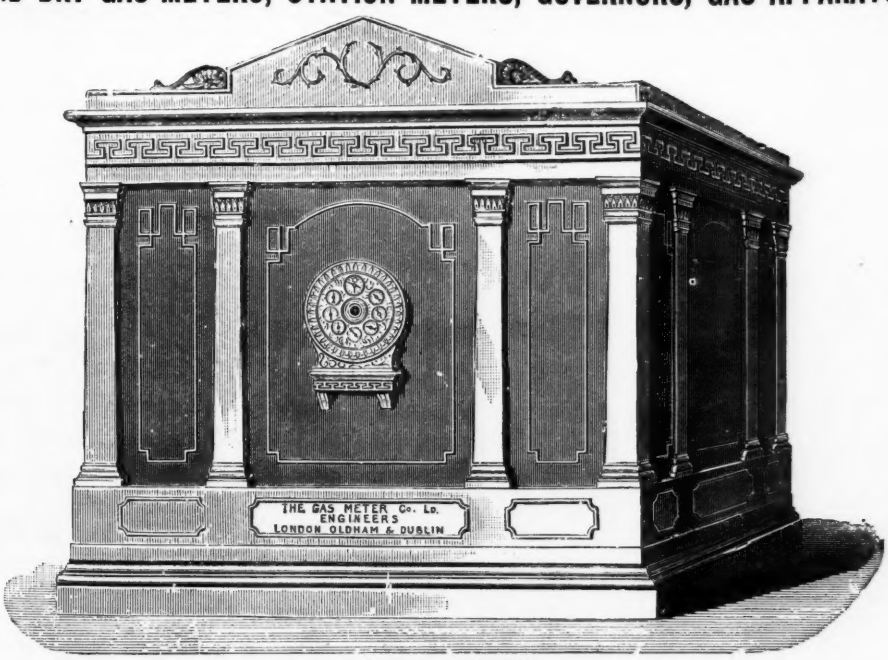
Sole Makers of the celebrated "ACME" GAS COOKERS used by H.R.H. the Duke of York, CARVING-TABLES, HOT CLOSETS, and JAPANNING OVENS, &c.

THE GAS-METER COMPANY, LIMITED

MANUFACTURERS OF

WET AND DRY GAS-METERS, STATION METERS, GOVERNORS, GAS APPARATUS, ETC.

SQUARE STATION METERS WITH PLANED JOINTS.



STATION METERS IN CYLINDRICAL CASES.

DESIGN No. 2 PATTERN.

STATION METERS MADE AT THE COMPANY'S WORKS, OLDHAM, LATE WEST & GREGSON. Established 1830.

For Prices and Particulars apply to

R. L. ANDREWS, General Manager.

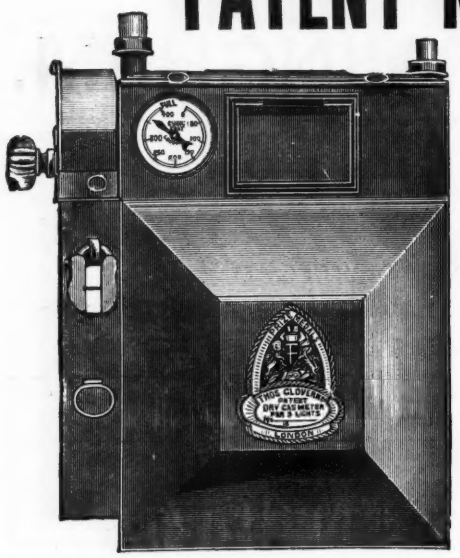
Works: 238, KINGSLAND ROAD LONDON; UNION STREET, OLDHAM; HANOVER STREET, DUBLIN.

Telegraphic Address: "METER."

[See Advertisement on back of Wrapper.

THOMAS GLOVER & CO.'S

PATENT NEW IMPROVED PREPAYMENT METER



For Pennies, Shillings, or any Coin.

Simple in Mechanism.
Positive in Results.
Price Changer *in Situ.*

GUARANTEED FOR FIVE YEARS.

Telegraphic Address: "GOTHIC LONDON." Telephone No. 6725.

THOMAS GLOVER & CO., LTD.,

DRY GAS-METER MANUFACTURERS,

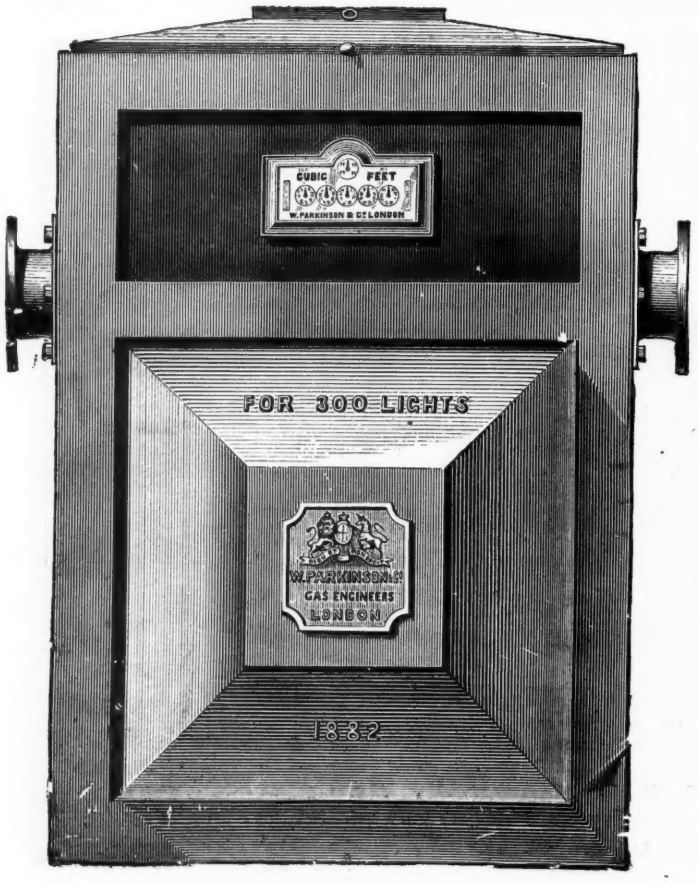
214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

BRISTOL: 62, VICTORIA STREET. *Telegraphic Address: "GOTHIC."*

BIRMINGHAM: 1, OOZELLS STREET. *Telegraphic Address: "GOTHIC."*

MANCHESTER: 37, BLACKFRIARS STREET. *Telegraphic Address: "GOTHIC."*

W. PARKINSON & Co.



MANUFACTURERS OF

DRY METERS

OF THE VERY BEST QUALITY.

The **DIAPHRAGMS** are of the Finest **PERSIAN SHEEP SKINS.**

The **CASES** are of the Best **CHARCOAL-TINNED PLATES.**

WET METERS,

With PATENT THREE-PARTITION DRUMS.

STATION METERS AND GOVERNORS,

PRESSURE & EXHAUST REGISTERS

MOTIVE POWER METERS,

Test Gasholders, Experimental Apparatus, &c.

PRESSURE-GAUGES OF EVERY DESCRIPTION.

NEW ILLUSTRATED CATALOGUE AND PRICE LIST
Sent post free on application.

COTTAGE LANE WORKS, CITY ROAD,

LONDON.

Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS,

BIRMINGHAM.

Telegraphic Address: "GAS METERS."

[See also Advt., p. 213.

CONTENTS.

EDITORIAL NOTES:—
GAS, LIGHTING, &c.— PAGE
A Subject for Inquiry . . . 173
Two Good Papers . . . 174
A Piratical Bill of the Reigate Corporation . . . 174
Lord Penrhyn and his Quarrymen . . . 174
WATER AND SANITARY AFFAIRS—
The Government and the London Water Question . . . 175
The Conservators of the Thames and the Abstraction of Water . 175
ESSAYS, COMMENTARIES, AND REVIEWS:—
Gas and Water Companies in the Stock Market . . . 176
Electric Lighting Memoranda . . . 176
The Jubilee of the Berlin Municipal Gas-Works . . . 177
English Weights and Measures . . . 178
Water Bills for 1897 . . . 179
COMMUNICATED ARTICLE:—
Sulphate of Ammonia. By H. H. Cousins, M.A., Principal of the South-Eastern Agricultural College, Wye . . . 180
TECHNICAL RECORD:—
The Effect of "Holophane" and Diffusive Globes on the Incandescent Gas-Light . . . 181
The Water Supply of Small Towns and Rural Districts . . . 181
REGISTER OF PATENTS:—
Coin-Freed Fluid Meters—Hollanders, Leather, and Taylor . . 183
Incandescence Bodies for Gas-Burners—Wheatley, W. H. (Woernle, F., and Schmid, C.) . . . 184
Coin-Prepayment Mechanism for Gas-Meters—Blackie, D. . . 184
Incandescence Mantles for Gas-Burners—Nicholls, W. . . . 184
Electric Gas Lighting Devices—Morstein, O. von . . . 185
Incandescent Gas Lamps and Burners—Crowe, R. . . . 185
Patent Notices . . . 185
CORRESPONDENCE:—
Stopped Ascension-Pipes . . . 185
The German Term for "Prepayment Meter" . . . 185
PARLIAMENTARY INTELLIGENCE:—
House of Commons—Government Proposals; Private Members' Bills; Electricity and Gas Meters . . . 186
Private Bills (Session 1897)—Opposition on Standing Orders . . 186
LEGAL INTELLIGENCE:—
High Court of Justice—Chancery Division—The Incandescent Gas-Light Company's Patents . . . 186
High Court of Justice—Queen's Bench Division—
Conservators of the River Thames *v.* Southwark and Vauxhall Water Company . . . 187
Reg. *v.* The Justices of London (*ex parte* East London Water Works Company) . . . 189
County of London Assessment Sessions—Southwark and Vauxhall Water Company *v.* The Guardians of Lewisham Union . 190
Wilson and Son *v.* Arden Hill and Co. . . . 190
The Incandescent Gas-Light Patents in France . . . 190
Breach of Contract to Supply Cement . . . 191
The Charge of Embezzlement against a Collector . . . 191
MISCELLANEOUS:—
Extensions at the Leeds Gas-Works—Local Government Board Inquiry . . . 191
The Condition of the Middlesbrough Gas-Works—Report by Mr. Corbet Woodall . . . 192
Agitation against Water Gas at Liverpool . . . 192
The Gas Question at Southport—Lecture by Professor Lewes . . 193
The Market for Sulphate of Ammonia during the Past Year . . 193
Thirlmere Water for Wigan—Local Government Board Inquiry . 195
The Water Supply of Paris: Its Rise and Progress . . . 195
Notes from Scotland . . . 197
Current Sales of Gas Products . . . 198
Coal Trade Reports . . . 198
Gas and Water Companies' Stock and Share List . . . 199
PARAGRAPHS:—
OBITUARY: Mr. J. S. Charlton; Mr. H. Shimeld; Mr. G. Barker 179
PERSONAL: Mr. C. R. Bellamy; Mr. W. Monteith; Mr. C. Vernon Boys; Alderman James Crosland; Mr. W. Hardie . . . 179
Society of Engineers—Infringements of the Welsbach Patents . 175
Coal Mining in the Midlands . . . 179
Mr. W. J. Dibdin on the London Water Supply . . . 183
Explosion of a Station-Meter at Redcar Gas-Works . . . 185
The Hull Corporation and the Kingston-upon-Hull Gas-Works—Costs in the Driffield Gas-Works Transfer . . . 191
Brentford Gas Company—Colne Valley Water Company—Gas Explosion at Nine Elms—The New Water-Works at Richmond . 197
Penzance Water Supply—Windsor and Eton Water Supply—Progress of the St. Mary Church Gas Supply—Annual Dinner of Employees of The Gaslight and Coke Company—Local Authorities and the London Water Question . . . 199
Proposed Extension of the Burnley Corporation Gas and Water Works—The Southampton Corporation and the South Hants Water-Works—Mr. J. M'Gilchrist on Coal Gas and Its Inventor—The Chichester Corporation and the Water-Works—Opposition to the Weymouth Gas and Water Bills—The Basis of Charge for Water in the Stockport Water Company's District . . . 200
Ashton-in-Makerfield Gas Supply—The Capital of the East Surrey Water Company—Additional Works for the South Staffordshire Water Company—Incandescent Gas Lighting at Chippenham—The Recent Dismissal of Gas Workers at Leeds—The Newcastle Corporation and the Tynemouth Corporation Water Bill—Mid-Sussex Water Company—The Duke of Norfolk and the Water Supply of Littlehampton and Arundel—Gas Supply at Dover . 201

TO SUBSCRIBERS.

TERMS OF SUBSCRIPTION TO THE "JOURNAL":
One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in Advance.
If credit is taken, the charge is 25s. a year.

Subscribers who desire to avail themselves of the reduction in the Subscription by paying in advance for the Year 1897, are reminded that this can only be done during JANUARY.

Post-Office Orders should be made payable at the Chief Office, St. Martin's-le-Grand; Cheques crossed "Union Bank of London."

All communications, remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

EDITORIAL NOTES.

A Subject for Inquiry.

MATERIALS are fast accumulating for that parliamentary inquiry into the general results of the municipalization of gas supply in Great Britain which cannot be much longer delayed. In making this observation, we do not presume to prejudge the finding of any such investigation; but it is a matter of common knowledge that in some places the administration of the gas supply by the Local Authorities has not altogether answered the anticipations of those who favoured the movement. It is very nearly time, therefore, that the effect of the last few years' legislation, which has placed many millions' worth of gas property at the disposal of Local Authorities of all degrees of importance, should be reviewed, with the object of distinguishing and correcting any points of legislative practice in this regard that may appear to have worked imperfectly. There are some Municipalities that have administered their gas undertakings in the spirit of true statesmanship; and it is their example which is always cited when any politician essays to force on the operation of municipalizing or nationalizing similar public services. In the background, however, there lurk many examples of a very different character, as is well known to those whose business it is to keep the whole field of the British gas industry in review. Starved works, underpaid management, overworked staff, workmen deprived of the advantages of enlightened gas-works administration—all these drawbacks to municipalized gas supply exist in not a few instances. There is only one cause operating to produce such results; but, unfortunately, it operates in the majority of gas undertakings that have been municipalized after the English fashion. In most Acts of Parliament authorizing the transfer of gas-works to Local Authorities, there occurs, at the end of the clause prescribing the purposes to which the gas profits are to be applied, the apparently innocent direction that any surplus remaining after the working expenses and capital charges have been met shall be "carried to the district fund." This is the fountain and origin of the evils already indicated. It is not even stated that the proportion of profits to capital is to be limited, as in the case of Gas Companies. The consequence is that, among other things, everybody connected with the gas-works has to work seven days a week. The example of Middlesbrough, mentioned in another column, is probably not worse than many another. Here, however, at the eleventh hour—for the gas-works seem to have been pressed to the last extremity—Alderman Hugh Bell, the Chairman of the Corporation Gas Committee, has awakened his colleagues to a consciousness of the fact that municipal gas-works administration has responsibilities as well as rights, and an examination of the works has been made at his instigation by Mr. Corbet Woodall. Mr. Woodall's report is not published in full; but it is possible to read a good deal between the decently-veiled suggestion that "the "undertaking will be not less, but more profitable, if there "is a liberal expenditure upon general maintenance."

Very much the same tale appears in the case laid before the Local Government Board Inspector in support of the application of the Corporation of Leeds for a further gas loan of £100,000. The Town Clerk told the Inspector "that during the winter months, the average amount of "gas actually sold was considerably larger than the pro-"duction"—he meant, of course, for week days. This is as much as to say that the reserve upon which the Leeds Corporation have been content to rely was the Sunday working of their gas-making staff. And even so it has not been possible to maintain the full pressure in the mains. The statement is anything but creditable to the Corporation. Leeds is apparently rousing itself to the necessity of putting the gas-works undertaking in proper order; but, of course, the works and plant should never have been allowed to fall so far behind current requirements. When municipalization is talked of in a general sense, it is customary to argue that Local Authorities ought to be "model employers." So far as the concrete example of gas manufacture and supply goes, it is impossible to cite it in support of the general plea. We shall probably be accused of repeating an old story in thus pointing to the partial failure of gas municipalization to justify itself in comparison with company administration. We are not so

reactionary, however, as to talk of company management in connection with gas supplies that have long passed, for good or for evil, out of private hands. It is quite reasonable to urge that the municipal management of gas supply is still in the stage of probation. All publicists who have written upon the subject generally take this view; and most of them think that at least a generation's experience will be necessary to prove how far the constant succession of elected ratepayers' representatives is consistent with the efficient control of municipalized undertakings. This period is fast drawing to a conclusion in respect of the largest English examples of the supply of gas by Local Authorities; and criticism is therefore in order in drawing attention to what appears to be a weakness of the usual statutory settlement of such undertakings. To put it briefly, Parliament may be expected before very long to inquire whether Local Authorities, on the whole, are to be implicitly trusted with the gas office till.

Two Good Papers.

THE last issue of the "JOURNAL" contained two technical papers of uncommon merit, covering between them a great deal of the ground that gas engineers have to cultivate to the best of their ability. Mr. A. G. Glasgow's paper, modestly entitled "Notes on Carburetted Water Gas," was a timely production which contains most of the information required by those gas managers who are legitimately curious to know how this branch of illuminating gas manufacture has approved itself in English practice. We are greatly in favour of the reasonable repetition of technical papers on particular subjects. When a certain department of technics has been fairly introduced to the world, it is of the highest importance that its subsequent history should be recorded from time to time. For this reason, Mr. Glasgow's contribution to the contemporary chronicles of carburetted water gas is to be received with due appreciation of the continuous interest of the subject, and recognition of the author's competence to deal with it. Carburetted water-gas manufacture for British gas-works is getting to be an old story now; but the question of how far it is suitable for adoption in this country is as fresh as ever it was. It is this question that every gas manager to whom it is presented must answer with regard to his own circumstances; and one of the worthiest portions of Mr. Glasgow's paper is the passage in which he shows that the expediency of the adoption of carburetted water-gas plant "is a ques-"tion of locality rather than process." He may not be quite justified in his broad claim for the "universal "applicability throughout the United Kingdom" of carburetted water gas as an auxiliary to coal gas manufacture; but it is quite true—paradoxical as the statement may appear on the face—that there are many places where it would pay to introduce carburetted water gas, though this variety of gas might be no cheaper than the coal gas previously made in the locality. We have never advocated carburetted water gas for the United Kingdom on the score of cheapness. That it has other advantages, however, it is impossible to deny; and Mr. Glasgow has stated very fairly what these recommendations are. Altogether, his paper is a valuable exposition of the actual state of this particular technical development.

The other excellent piece of technical writing to which we desire to refer is Mr. D. Macfie's Edinburgh lecture on "Gas Control from Meter to Burner." It is impossible to have too much of this kind of semi-popular teaching in the disposal of what is really a prime necessary of town life. The strength of the "local colour" in Mr. Macfie's composition is one of its chief recommendations. Nobody wants to hear about gas supply "in the abstract"—as the Scottish young lady considered the subject of love. It is the concrete question of gas bills, and what can be obtained in return, that interests the average consumer. It appears that since the gas supply of Edinburgh has been municipalized, the standard of illuminating power has been unostentatiously lowered from 28-30 to 25 candles. Mr. Macfie gently puts it that to assume the last-named average would "not be uncharitable." Charity is indeed a very handy virtue for use in the consideration of a municipal gas supply, although it is not greatly in demand in regard to supplies by gas companies. The reflection that evidently weighed heavily upon Mr. Macfie's consciousness during the preparation of his lecture was that, while Edinburgh gas is still nominally of high illuminating quality, the city is one of the worst-lit centres of population in the wide world. It is easy to see by his observations how the figment of high illuminating power in the gas supply has operated to keep the people of Edinburgh in semi-darkness. It will take more than one lecture, and more than one expert in lighting as able as Mr. Macfie, to break through this evil tradition. A good beginning has been made, however, and satisfactory progress must follow, albeit slowly. Edinburgh has done well in several respects for the gas industry. It is unnecessary to mention here the many admirable specialists whose names are associated with the Scottish capital; but the city itself has never been other than poorly lighted, because its gas supply has been too good, as goodness has hitherto been reckoned. The Corporation have made a small move from the old traditions; but it has so far been a one-sided action, which requires to be adjusted to a long array of considerations. Mr. Macfie has put the population of Edinburgh under an obligation to him by his masterly statement of these factors of good lighting.

A Piratical Bill of the Reigate Corporation.

THE Reigate Corporation are promoting a Bill in Parliament which, in respect of its subject-matter, would not, in the usual course, call for mention in these columns, inasmuch as it is a measure "to define and regulate the rates "and charges of the East Surrey Water Company for the "supply of water within the borough of Reigate, and to "amend the Acts of the said Company so far as they affect "the said borough." The latter portion of this title, however, covers a scheme of legislation of so pernicious a character, and so far-reaching an aim, as to merit the attention of every statutory transit, trading, and supply company in the kingdom. The old borough of Reigate was until last year supplied with water by a small local Company; but by an Act of the past session this undertaking was transferred to a much larger Company previously engaged in supplying all the surrounding district, including the newer portions of Reigate itself. The Act also provided that the rates and charges for water in the transferred area were to be the same as those levied by the Company in the other parts of their district, as defined by an Act of 1862. On the face of it, nothing could be fairer than this arrangement. Now, however, the Corporation of Reigate have taken upon themselves to review this statutory settlement of the local water supply, and, having formed the "opinion that the scale of rates and the charges of the "Company and the recited enactments relating thereto "press unduly on the inhabitants of the borough, and "ought, in their interests, to be revised"—we quote from the preamble of the Bill—they have gone to Parliament with the cool suggestion that "it is expedient "to prescribe a new scale of rates." Such a piece of municipal impertinence is only paralleled by the attempt last year of the Dublin Corporation to forcibly effect an alteration of the initial price for gas of the Alliance and Dublin Consumers' Gas Company. Of course, if this absurd Reigate Bill is not quashed by other means, the Select Committee will throw it out, as in the Dublin precedent. But something ought to be done to teach local authorities that a better ground than their own "opinion" must be found for these sporadic legislative attacks upon Companies working under statutory regulations. It is not a question of what is the proper water-rate for a house in Reigate, but of the use or abuse of Private Bill procedure. What is there to prevent this egregious Corporation from forming the opinion that the railway fares between Reigate and London are too high, and promoting a Bill in Parliament to regulate them according to their own fancy in such matters? If the affair goes on and gets into Committee, it is to be hoped that the attacked Company will apply for costs against the Corporation. The application would probably succeed.

Lord Penrhyn and his Quarrymen.

A GREAT deal of factitious excitement has been manufactured in some of the "popular" newspapers in regard to the labour troubles at the Bethesda slate quarries belonging to Lord Penrhyn. If the works had been owned and worked by a company, or a common commercial person, nothing like so much fuss would have been made of the dispute. But the opportunity for having a fling at an aristocrat, a landowner, and a large employer of labour all at once has been an attraction to which our Socialistic and Trade Unionist contemporaries have ecstatically succumbed. Politicians have raved at Lord Penrhyn; mass

meetings have execrated him; he has been cursed with unction in leading articles; the Board of Trade has looked askance at him—and all because he has dared to exhibit a preference for carrying on his quarry business in his own way, rather than in the manner dictated to him by his employees. The latter, of course, are supposed to be at liberty to adopt any principle of organization or line of policy in the ordering of their relations with their employer which seems good in their own eyes; but the employer must bow to their judgment in such matters. In the present case, Lord Penrhyn apparently intends to show that he means to be master of his own business as well as a wage-payer; and this is enough to set all the forces of Trade Unionism against him. It is not the first strike for the principle that has occurred at Bethesda. There was a similar one about eleven years ago, which failed miserably. Lord Penrhyn has published a declaration to the effect that it is a matter of indifference to him whether his workpeople join Trade Unions or remain free; but he will not have in force among his employees any form of combination "which forbids the workman to obey the "orders of his master or those of his officials, or which "prohibits evidence being given or an explanation being "made to the management by the workmen unless such "evidence or explanation has previously been reported "to the Committee." He is firmly resolved not to allow the existence of a divided allegiance in his works; and upon this resolve he has taken his stand. It hardly seems an arbitrary attitude; but, at least, one would think that Lord Penrhyn has as much right to say he will not have his quarries managed by a Committee of his employees as the latter have to strike because they want to organize themselves in this particular way. Lord Penrhyn's objection to the Committee system is no matter of abstract reflection, or personal feeling on his part. He has had plenty of experience of the system, and has found that it did not work fairly to all parties concerned in the quarrying interest. Matters came to a crisis with the passing of a conditional resolution in favour of a strike at a future date; whereupon Lord Penrhyn, judging the Quarry Committee to be at the bottom of all the trouble, promptly discharged the whole of them. Upon this all the men elected to strike; and so the issue was joined. Not the least interesting feature of the dispute is the incidental circumstance that the conciliatory efforts of the Board of Trade have proved powerless to compose the difference between the parties. Naturally, the men wished to refer to the Board the whole of the matters in dispute; but, seeing that the principal point of difference was Lord Penrhyn's objection to the Quarry Committee, upon which the men seemed disposed to insist, there was no common ground between the contending parties. The fact illustrates the baselessness of the dream of universal arbitration as a substitute for war. So long as a dispute is concerned only with pecuniary or territorial questions, mediation is always possible, and may be fruitful of a settlement acceptable by both parties. But let a question of right arise, and there is nothing to be done except fight for it until one side or the other gains the victory.

Society of Engineers.—The first ordinary meeting of this Society for the year 1897 will be held next Monday, at the Royal United Service Institution, Whitehall, when the President for the past year (Mr. S. H. Cox) will present the premiums for papers read last session; and the new President (Mr. G. Maxwell Lawford) will deliver his Inaugural Address.

Infringements of the Welsbach Patents.—The Incandescent Gas-Light Company, Limited, write calling attention to the trouble to which they have of late so frequently been put in dealing with infringements of the Welsbach patent for mantles—both on their own account and on behalf of persons who have been beguiled into purchasing mantles made in infringement of the patents. They point out that up to the present time they have obtained close upon one hundred judgments against infringers of the patents; and they wish it to be known that, in case of disobedience to the orders of the Court in regard to injunctions, they will certainly apply for the committal of offenders to prison. They lay particular emphasis on the fact that last November an injunction was granted against the Meteor Incandescent Lighting Company, Limited, restraining them from manufacturing, selling, or using any incandescent mantles containing thorium and other rare earths; and they desire it to be known by both the public and the trade, that users of infringing mantles are equally as liable as sellers. The letter closes with a long list of persons against whom injunctions have been granted, most of which cases have from time to time been noticed in our law reports.

WATER AND SANITARY AFFAIRS.

THE announcement in the Queen's Speech that a Bill will be introduced this session "to improve the arrangements "for water supply in this Metropolis," while not altogether felicitous in its mode of expression, is sufficiently explicit to extinguish the notion previously entertained in some quarters that the Government were no longer disposed to bring in a Bill to deal with the Metropolitan Water Question. In discussing this subject a fortnight ago, when the "Pall Mall Gazette" had undertaken to throw some light on the situation, we ventured to expressed surprise that the Government should be thought content to abandon the task to which they were practically committed. Our doubts on this point prove to be justified; and we see that something more is intended—or at least will be attempted—than opposing the Purchase Bills of the County Council, and calling in the aid of a Commission to advise as to the best plan to be adopted. With respect to the issue, it may be fairly said to baffle conjecture, unless we fall back on the old story of the mountain and the mouse. Even the "Pall Mall Gazette," which professed to know so much the other day, now confesses its want of knowledge concerning what will happen in Parliament on this subject, and can only go so far as to say "it is growing clearer than ever that the "Government have in the London Water Question a "more serious business than they looked for." After this, we have again the suggestion of a Commission, by the help of which a properly-digested scheme, may be produced in 1898 or 1899. "The Times" conceives that the question may be dealt with during this year, "or, at any rate, the "ground may be laid for dealing with it; but it ought "not to be indefinitely postponed." Sir F. Dixon-Hartland has now brought in a Bill "to amalgamate the "Water Companies in and around London."

The "Daily Chronicle" looks upon the Government Water Bill as "one more device of Mr. Chaplin and his "reactionary friends to save the Water Companies from "any danger of purchase." Assuredly, the Government need take no such trouble. The Purchase Bills of the County Council are doomed already. In a letter of considerable length, published in "The Times" last week, and signed "Aquarius," the provisions of the Purchase Bills are analyzed with consummate skill, showing their unjust and preposterous character; the writer, in conclusion, earnestly commending "this curious outcome of "Progressive municipal politics to the study of statesmen, "capitalists, and ratepayers." "Aquarius" has ceased to wonder that the Bills received the approval of the London County Council by the very narrow majority of seven. He now thinks the wonder to be that any man of business should consent to wantonly squander public money in a scheme for the detailed consideration of which "Parliament is not in the least likely to waste the time of "a Select Committee." A curious incident arising out of this letter is that, the Local Authorities of the outer ring being warned by the writer to carefully scrutinize a certain part of the Bill, the Chairman of the Surrey County Council writes in reply to say that the Surrey authorities are quite capable of taking care of themselves. The meaning of this somewhat ambiguous announcement is made plain by a report on the subject of the Purchase Bills which comes before the London County Council to-day, in which the Parliamentary Committee state that they have been engaged in discussing terms of agreement with the authorities outside the County of London, but within the area of the Water Companies, and have already made very considerable progress. The Committee now present two agreements to the Council, which they recommend for acceptance. One has reference to the Surrey County Council, and the other to the Corporation of Croydon. Mr. M'Kinnon Wood, in a letter which appeared in "The Times" yesterday, disputes the argument that the County Council know their Purchase Bills are "foredoomed to failure," and that therefore they are idly wasting the money of the ratepayers. He claims that the Bills should go before a Select Committee—a result of which, nevertheless, he seems by no means confident. As a further contribution to the water controversy, we may mention a very important article in "The Times," from a correspondent, in which the position of London in regard to its water supply is put in contrast with the conditions which affect Manchester, Liverpool, Birmingham,

and Leeds. If theory favours municipalization, clearly the facts do not.

The injunction granted by Mr. Justice Mathew, at the instance of the Thames Conservators, by which the Southwark and Vauxhall Water Company are to be restrained from taking more than 24½ million gallons from the river in any 24 hours, raises an important question as to the conditions under which the wants of the public are to be supplied. The injunction may have good legal foundation, and yet may have a very miserable practical application. It is a pity the Conservators could not have enlarged their agreement with the Company, so as to allow the latter to take the supply which the public demand. The view commonly held with regard to this subject is that the Company appropriate the water at their absolute will and pleasure, for their own peculiar benefit; whereas the fact is that, for certain substantial reasons, they would be very content to make a less quantity suffice, if it were possible to do so. Every gallon has to be pumped to a higher level; fuel must be consumed to generate steam; and machinery must be provided to lift the water, as well as reservoirs and mains to receive and distribute it. The idea that Water Companies take a furtive delight in spending money is a popular delusion, diligently fostered by an extensive class of writers and speakers. To such an error the Conservators ought to be superior; and we might expect them to avoid playing the *rôle* of the Progressives, who persuaded Parliament to reject the East London Company's Bill in 1893, and thereby brought about the unfortunate scarcity of 1896. The result of the present proceedings is an injunction—not merely against the defendant Company, but against the consumers. The Company might henceforth send into the district just so much water as is legally allowed, and tell the consumers to make the best it. In regard to the judgment delivered by Mr. Justice Mathew, it should be observed that the question of sufficiency in the supply received no recognition. The decision was founded upon the agreements. These were declared to have legal force; and judgment was given accordingly.

In 1852, the agreement between the Southwark and Vauxhall Company and the then Conservators was for 20 million gallons of water per day. In 1886, this was enlarged to 24½ million gallons. The Conservators say that this is enough in 1897. Yet compared with 1852, the quantity is singularly small; being simply an advance of a little over 22 per cent., while the population must have been at least doubled. In 1867, the population of the district was only 465,000; whereas it is now close upon 804,000. The increase has not been so rapid in recent years as between 1882 and 1886; but it has been going on at an accelerated pace since 1891, and has amounted nearly to 76,000 in the last ten years. The growth now may be taken at more than 8000 per annum; and it is impossible that the water supply can be stationary. It may be said that the rate of supply per head is high. Yet taking the returns for 1895, we do not find that the supply per head is so large as that of the Chelsea or the Grand Junction Company. The state of the case, as shown by General Scott's report for October last, is sufficiently ominous. There we find the Company taking from the Thames more than seven million gallons per day in excess of their legal allowance. This comes in addition to nearly two million gallons from the Streatham well. If in 1895 the Company took no more than two million gallons from their Streatham well, they must then have taken from the Thames nearly seven million gallons in excess of their agreement. Accepting the judgment of the Court that the agreements were not *ultra vires*, we venture to fall back on the principle that the public safety is the supreme law. This, we fear, is prejudiced by the present position of things. There is a statutory obligation laid upon the Company to supply their district with water; and the quantity lately found necessary for this purpose is to be curtailed by some millions of gallons per day. Whether or not the extra quantity is really required in order that the Company may fulfil their statutory obligations, is a consideration which has been shut out by the finding of the Court that the agreements entered into with the Conservators were binding on the Company. But facts are stronger even than law; and it is practically impossible to deny to the people the use of a river in order to meet their demand for water. If the Thames is not adequate, let the Company be relieved of their responsibility.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 199.)

THE Directors of the Bank of England reduced their minimum rate of discount from 4 to 3½ per cent., which was inevitable after the fall in the German Bank rate from 5 to 4 per cent., and the continued decline of rates in the open market. The lower value of money has not, however, helped things on the Stock Exchange, where speculative dealings are still on a very small scale. The most activity was again in the Home Railway department, where prices are tending upwards on the good dividends. As regards investment stocks, Consols mark a rise of ⅛ for money; and there has been a distinct recovery in Indian stocks, while Colonial issues are likewise better—the market paying no attention to the failure of the West Australian loan, for which the public only tendered for £233,300. Business in Gas and Water stocks was less active during the past week; but there is still an investment inquiry especially for Gaslight "A," which rose 3 per cent.—business being recorded at 325. This is the only alteration in the value of Metropolitan Companies' issues. The South Metropolitan Company are again giving their consumers the opportunity of investing in the ordinary stock, at the market price, free of all expenses. The Company have adopted this plan since 1890; and the amount thus invested by the consumers is £408,000. With regard to Suburban and Provincial Companies, Bromley ordinary has risen 3 points; and the 7 per cent., 1. Brighton "A" ordinary has also advanced 2. In the Continental division, Imperial Continental is harder—that is to say, the selling price has risen 2, to 220; but the buying quotation remains at 225. Australian debentures show a further improvement of 1 per cent.; but Bombay, Cape Town ordinary, Monte Video, People's Gas, and San Paulo, all show a weaker tendency. As regards Water stocks, the market has been very quiet; but values are well maintained—the only alteration on the week being a rise of 2 per cent. in East London, to 230-35.

The daily operations were: Monday opened with a moderate business in Gas stock. The most dealings were again reported in Gaslight issues. Business was recorded in the "A" stock between 318 and 320; and the quotation advanced to 2. The 4 per cent. debentures changed hands at 142. Imperial Continental and Metropolitan of Melbourne also met with attention. Water stocks were very quiet; but East London rose 2. On Tuesday, business was again quiet, though Gaslight "A" was in request. A further rise of 1 was recorded; and dealings took place up to 320½, and in debentures at 142. Transactions were recorded in Dublin Alliance 10 per cent. at 23½; while Australian Gas debentures rose 1. Water stocks were unaltered. Business, however, was done in East London 4½ per cent. debentures at 166; Lambeth 10 per cent., at 272; Southwark and Vauxhall 4 per cent. "A" debentures, at 149½; and West Middlesex, at 315. Wednesday was another quiet day. Brighton "A" ordinary rose 2; and Bromley 10 per cent., 1. Business was done in Crystal Palace ordinary at 140½; Gaslight "A," at 320½; Imperial Continental, at 221; and South Metropolitan, at 148½. In Water, East London 3 per cent. debentures changed hands at 107; Grand Junction 4 per cent. debentures, at 152½; and Lambeth 10 per cent., at 273½. On Thursday, the feature was the rise of 2 in Imperial Continental; business being done at 225. Gaslight "A" marked 321; British, 56½; and European, 18⅜. Water shares were quite featureless. Business on Friday and Saturday was extremely quiet. Bombay ordinary and new fell ½ each; while Water stocks were unchanged. A few dealings were recorded in Gaslight "A" at 321; Continental Union, at 261; and do. 7 per cent. preference, at 217¾.

ELECTRIC LIGHTING MEMORANDA.

The Cost of Arc Lamps at Londonderry—The St. James's and Pall Mall Company's Dividend—The Redemption of Electric Lighting Companies' Capital—The Electric Omnibus—A View of Electric Traction Systems.

A PERIOD of comparative calm appears to have supervened upon the stormy scenes which signalized the early days of the Londonderry Corporation electric lighting undertaking. This venture is of peculiar interest, in that it does public lighting only, and is therefore probably a unique concern of its kind. The Corporation were persuaded to go into the street lighting business in order to save money, and at the same time improve the aspect of the city thoroughfares. They have, of course, been disappointed in regard to the first matter; and at one time it looked as if they were not to gain much on the second. The arc lighting by the Corporation plant was at the start distinctly unsatisfactory; but matters have been greatly improved in this respect during the past year. The accounts relating to the undertaking are analyzed in the current number of "Lightning;" and the figures are valuable, as showing what arc lamps really cost when served under the most favourable conditions, and used solely for street lighting. This information is by no means easy to obtain in the case of electricity supply undertakings which engage in both arc and incandescent lighting. Londonderry has equipped itself with 174 arc lamps of the 500-watt

size, at a capital cost of £19,786, which works out to nearly £115 per lamp—quite enough, one would think, to pay even for such luxuries. In order to cut down working expenses, half of the circuits are extinguished at midnight, and re-lighted during the winter months from 5.30 a.m. to daylight. The total expenditure per lamp on revenue account, including sinking fund, was £21 1s. 3d. for the year ending Nov. 24 last. The total cost of electricity works out to 3·22d. per unit, of which the works' costs only represent 1·66d.; so that it is not the technical management that runs away with the money. The coal cost only 0·45d. per unit, which does not leave much room for economy; while the total cost of management, including the salaries in the Engineer's department, was only £240. Of course, the establishment and office expenses are largely borne by the general Corporation executive. Yet with everything so cut down to the smallest proportions, Londonderry has to pay £3665 a year for improved street lighting. It is to be hoped the ratepayers are satisfied with the return for their money.

The first dividend announcements of electric lighting companies have already appeared; the absolute priority resting with the St. James's and Pall Mall Company, who made haste to acquaint the world with the pleasing circumstance that the Directors would be in a position to recommend the payment of a dividend after the rate of 10½ per cent. for the past year. We heartily congratulate the Board, the proprietary, and the management on the auspicious event. Our contemporary the "Electrician" expresses its very natural jubilation over the announcement; remarking that the new rate "almost attains the bloated dimensions of a big gas company's return." This observation is hardly fair, because our contemporary must know very well that the generation of participators in a 10½ per cent. gas dividend has mostly passed away; whereas the St. James's Company have come to this pitch of prosperity in eight years. It is due to the St. James's Board to confess, as our contemporary does, that as they have the cream of the electric lighting of London to deal with, so they have proved themselves capable of managing their affairs to good commercial advantage. This latter result might not have followed. Electric lighting eight years ago was an experimental business, and could easily have been so mismanaged as to ruin the very best district.

The prosperity of the St. James's Company will have some very interesting consequences. The Company are able to well and truly earn a good dividend, and also to make whatever provision for the future may be thought proper in the discretion of the Board. In this respect, the Company are an example to all electric lighting undertakings, whether public or private. There is the question of depreciation, for instance, which the St. James's administrators, though their system of supply is the low-pressure continuous one, and therefore the most durable known, resolve in a statesmanlike spirit. They would gladly make provision for the redemption of so much of their capital as is likely to be extinguished at the termination of their Order; but this has for the time being been prevented by the holders of their founders' shares. The existence of these shares is one of the few unfortunate things in the history of the Company; and they must be wiped out before the concern can be regarded as upon a thoroughly satisfactory financial footing. When this operation is completed, the Directors will be in the best position to show what they can do for the public and the proprietary.

We took note some time ago of the failure of an electrical omnibus to justify the promises that have been made respecting the capacity of electric accumulator traction for improvement. It is therefore only fair that we should notice the reported success of the second experiment of the kind on the 9th inst. According to these reports, an electrical omnibus on the Radcliffe Ward system made a successful trial trip, starting from Northumberland Avenue, and negotiating without apparent difficulty the comparatively mountainous St. Martin's Lane, "although it was loaded with all but the full number of passengers it is constructed to carry, and the streets were far from being in a good condition. In the crowded traffic of Oxford Street it showed itself to be perfectly under the control of the driver as regards both steering and speed." So this is to an extent satisfactory. Another report stated that the omnibus travelled rather slowly at its best, which is a serious drawback; and, of course, nothing is said as to the cost of running. The latter consideration will probably prove the main difficulty. Horse haulage is very cheap at present; and running expenses require to be kept low, in order to make a living profit out of penny fares.

The current number of the "Electrician" contains a supplement showing in tabular form all the ascertainable data concerning the electrical railways and tramways of the United Kingdom. Those included in the category of lines in operation number nineteen—quite a respectable showing; but, in order to make up the tale, such lines as the one on Ryde Pier have been included. It is only by a stretch of charity, moreover, that the term "in operation" can be applied to the "battery car" experiment on the Birmingham tramways. Of electrical railways properly so called, there are as yet only two examples in England—the City and Stockwell underground, and the Liverpool overhead lines. Our contemporary discusses its own data at considerable length; remarking upon the comparative dearth of new projects for electricity supply, and the numerous suggestions for new traction experiments. There is the widest possible diversity of practice in the equipment of these electrical lines. All kinds of systems are in use upon the existing lines, such as they are, with the exception of the "surface-knob closed conduit" and the "three-phase trolley." What the latter arrangement may be, we know not; but we venture to opine that the former classification may be intended to apply to the Westinghouse device, which we believe is to be tried at a congested tramway centre in Leeds. Our contemporary writes with some reserve of the trolley-wire system; and it now appears that expert opinion is greatly exercised over the choice between the "centre" and "side" wire varieties of the great trolley device, both of which have their partisans. The prudent conclusion is drawn that "doubtless, in fulness of time, we may be delivered from them both, and from all manner of overhead construction." Seeing that this country has not hitherto exhibited any particular regard for the trolley wire, this is not a very encouraging spirit in which to approach the question of the expediency of adopting electric traction by existing methods.

THE JUBILEE OF THE BERLIN MUNICIPAL GAS-WORKS.

The rise and development of gas-works which commenced operations in very modest fashion on the 1st of January, 1847, and fifty years later are supplying few less than one million burners, cannot but be of interest to many living beyond the area intersected by the 560 miles of mains now constituting the distributing system. It was, therefore, a happy inspiration that led the Municipality of Berlin to commemorate the fiftieth anniversary of municipal gas supply in that city by the publication of a brochure* on the town gas-works. The little book is, we learn, "compiled from official sources;" and it has the merit of work done by an expert and faithful abstractor. A few months ago, we had the pleasure of reviewing a work of wider scope by Dr. H. Lux, dealing with the "Lighting of Berlin" ("Journal" for Sept. 1 last, p. 407); and it is inevitable that the two books should in some measure come under comparison. We need only point out that Dr. Lux could avail himself of an author's license to comment on facts and statistics, and thereby co-ordinate them into a coherent narrative palatable to the general reader. The little Jubilee volume now under notice, on the other hand, gives a plain ungarnished history of the town gas-works; and, though less easy reading than Dr. Lux's book, it teems with significant figures and facts, a few of which we shall now select for our readers.

The gas supply of Berlin dates from the year 1826, when, in pursuance of a concession granted them the preceding year, the Imperial Continental Gas Association undertook the lighting of the city for a period of 21 years. The street lighting was carried out partly by gas, and partly by oil lamps. The concession could be renewed or altered by mutual agreement on the expiry of its term; and while the town was at liberty to take up other systems of lighting, the Association had the right to compete and to supply private consumers with gas for a longer period. Dissatisfaction with the manner in which the Association used its prerogative became rife in the City Council several years before the expiration of the 21 years' concession; and as terms for its renewal could not be agreed upon, the Municipality obtained, in 1844, the Royal Sanction to their undertaking the public lighting of the city from Jan. 1, 1847, the date on which the Association's responsibility terminated. The liberty of any inhabitant to supply himself with gas through other means was expressly reserved to him; and thus the Imperial Continental Gas Association remained in a position to compete for the lighting of private houses in those parts of the city in which its mains were already laid. The Association entered into a contract in 1854 to light the suburbs of Old and New Schöneberg; and since these were partially taken over by the Municipality in 1861, the Association have had the sole rights of gas supply in that part of the city. An excellent map of Berlin and suburbs, gives in tinted outline the limits of the areas at present supplied solely from the Municipal works, solely from the Association's works, and from the two in conjunction. As the Municipality alone have had the right to extend their mains within the city boundaries since 1847, the area supplied solely from their works is very much greater than that in which the Imperial Continental Gas Association have either sole or partial rights of supply.

The first of the Municipal gas-works was erected in accordance with the plans of Commissioner Blochmann, who had previously constructed the works at Dresden and Leipzic. The works for the supply of the town north of the Spree were erected in the Stralauer Platz; those for the south, in the Gitschinerstrasse. These, together with two gasholder stations, commenced work on Jan. 1, 1847, with the supply of 2019 public gas-lamps and 823 private burners. The English works on that date reduced the price of their gas from about 10s. per 1000 cubic feet, at which it had hitherto stood, to about 5s.; and since the Municipality forthwith adopted the latter price, the English works then allowed a rebate of 5 per cent. The great reduction on the former price led to a large number of inhabitants becoming gas consumers; and in 1859 a new works on the Müllerstrasse, in the north of the town, commenced operations. The three existing works were repeatedly enlarged;

* Die städtischen Gaswerke in Berlin, 1847–1897. Rückblick am fünfzigsten Jahrestage ihres Bestehens. Berlin; 1897.

but in 1873, a fourth works, in the Dantzigerstrasse, to the north-east of the town, was put in operation, in order to cope with the increasing demand for gas. The south side of the city was now felt to be inadequately supplied; and a site for a new works was chosen beyond the city walls near the suburb of Schmargendorf. This works came into operation in 1893.

The maximum daily output for which the five works have been planned is 35,775,000 cubic feet. Of this quantity, the Schmargendorf works supplies 12,361,000 cubic feet; the Dantzigerstrasse works, 10,595,000 cubic feet. The Gitschinerstrasse and the Müllerstrasse works have each a maximum daily output of 5,827,000 cubic feet. The price of gas in the early days of Municipal supply varied according to the term to which the agreement with the consumer related. The lowest price was at first about 5s. per 1000 cubic feet; and in 1862, it was reduced to 4s. 6d. In 1875, the graduated prices were abolished; and 16 pf. per cubic metre (about 4s. 6d. per 1000 cubic feet) was charged, subject to a rebate of 20 per cent. in cases where a separate supply was had for cooking, heating, or industrial uses. On July 1, 1895, the price of gas for these purposes was reduced to 10 pf. per cubic metre (about 2s. 10d. per 1000 cubic feet); while the price of gas for lighting remained at 16 pf.

Until the year 1851, the coal was put into the retort in five baskets made of strips of sheet iron, and at the expiration of six hours the baskets were withdrawn, and placed on trolleys on which they were covered up with close metal lids. The coke was thus quenched merely by exclusion of air, and proved of very good quality. The process was abandoned owing to the great wear and tear of the baskets, &c.; and quenching in the ordinary way was adopted. The retorts used at first were of cast iron; and ten were heated by one furnace. There were no condensers; but the main from the retort-house to the scrubbers could be sprinkled with water. From the scrubbers, the gas passed through milk-of-lime purifiers; and then through a vessel with a revolving drum, similar to that of a gas-meter, which served to a limited extent the purpose of an exhauster. From this vessel, the gas passed on its way to the holder, through a dry purifier charged with slaked lime. Blochmann's settings of ten retorts were replaced, between 1852 and 1856, by settings of seven fire-clay retorts; and these remained the standard pattern for many years. In 1876, trials of gaseous firing were started. At the present time, the customary setting consists of nine retorts. One generator, built out from the face of the stack in the stoke-hole, supplies two adjacent settings. There is now a trial stack of six settings of nine inclined retorts in use at the Müllerstrasse works; and an extension of this system is contemplated. In 1896, there were in the five works 387 settings, with a total of 3251 retorts.

In 1854-55, condensers were introduced, and have since been used in all the works. All now employed are vertical cylinders, with tubes for water circulation. Those recently erected are 50 inches diameter, and nearly 29 feet high, and have eleven or twelve tubes, from 4 to 5 inches in diameter. The gas passes through a series of six to eight of these vertical condensers, and afterwards through a Pelouze and Audouin extractor. The scrubbers employed on the works are 40 to 50 feet high, and are packed with wooden grids. The gas passes through a series of three. In the first liquor, in the second and third clean water, is admitted and trickles down the grids. The exhausters are of the beam-engine type, with two exhausting cylinders; but Körting's steam-jet exhauster has lately been introduced at the Stralauer-Platz works. Rotatory exhausters do not appear to have been tried at any of the works. Bog oxide mixed with sawdust has been the only purifying material in use for the last thirty years. It is revivified from eight to ten times. The recently constructed purifying vessels are about 24 feet long by 19 feet wide, and contain six tiers of grids. The largest station meters in use are designed to pass about 125,000 cubic feet per hour. The five works and three gasholder stations provide a total holder capacity of 24½ million cubic feet. The largest holder has three lifts, and a capacity of 3,300,000 cubic feet. There are in all 22 holders, all of which are enclosed in houses. In the construction of the larger houses, many ingenious devices were employed to obviate the necessity for extensive scaffolding. The largest mains used in the works are 42 inches in diameter. We have already mentioned the present length of mains supplied from the five works. Small experimental settings have from time to time been erected for the testing of coals, but have had to be pulled down for the purpose of giving room for extensions. A large experimental plant has now been designed, and will be erected at Schmargendorf works. At the Müllerstrasse works, there is a chemical and physical laboratory.

Until the year 1861, English coal was exclusively used at the works. Then trials of Silesian and Westphalian coals were instituted; and these were so satisfactory that, in 1864, the quantity of native coal carbonized exceeded that of English. Since then German coal has been used almost exclusively. During the twelve months ending April 1, 1896, 378,061 tons (about 372,000 English tons) of coal were carbonized. Of this quantity, 62·57 per cent. came from a pit near Zabrze, in Upper Silesia, 34·25 per cent. from two pits in the Waldenburg coalfield, and 3·18 per cent. from England. Coke is the only fuel now used for the retort furnaces, though in 1866-1871 some tar was burnt.

The total annual gas consumption fell back in 1892-93; but it has since far exceeded previous totals. The heaviest day's consumption so far has been about 21 million cubic feet. The consumption during the daytime—*i.e.*, the hours during which the public lamps were out—averaged in the last working year 26 per cent. of the daily consumption. On April 1, 1896, there were 1204 gas-engines using Municipal gas. The street-lamps (of which there were 20,356 at the close of 1895) are kept burning from dusk to daybreak, or for 3675 hours in the year.

The coke production for the past year amounted to 255,912 tons, of which 59,246 tons were used for firing the retorts. The boiler furnaces throughout the works were fired exclusively with breeze. About 36 per cent. of the cost of coal and retort-furnace fuel was not covered by receipts for bye-products.

The gas-works are at present controlled by a body of twelve deputies, of whom Town Councillor Namslau is President. It is to the courtesy of this Committee of Management that we are indebted for our copy of the Jubilee brochure.

ENGLISH WEIGHTS AND MEASURES.

We intimated a few weeks ago that Mr. H. J. Chaney, the Superintendent of the Standards Department of the Board of Trade, was about to publish a work on the above subject. It has now appeared;* and a very instructive book it is.

Mr. Chaney tells us in his preface that no recent account of the weights and measures of the British Empire has been published; and he has therefore made an attempt to indicate what is now the practice in their use, whether in trade or for the purposes of manufacture. In the first section of the book, the author deals with the origin of the Imperial system, the legal introduction of which into this country dates from 1824. It is based upon the units of length and mass—in other words, the yard measure and the pound, the standards of which are deposited at the Standards Office in Old Palace Yard, Westminster. It seems that provisions for obtaining uniformity in our weights and measures have been upon the Statute Book since the time of Henry III.; but even now this has not been realized. The standards legalized in 1824 were destroyed at the burning of the Houses of Parliament ten years later; but others were legalized in 1855. Mr. Chaney thinks there can be no doubt that the present Imperial standards have been accurately derived from those of Queen Elizabeth, which came from those of Henry VII. A description of these is given. After some remarks on the probable origin of our systems of weights and measures, the author deals with the units derived from natural constants or physical standards, and with the standards of Scotland, Ireland, the Channel Islands, the Isle of Man, the United States, India, Canada, and Australia. In the second section of his book, he describes the existing arrangements for the inspection and verification of weights and measures in use in trade; and in the third, the measures used for surveying.

The fourth section of the book is that in which our readers are specially interested, as Mr. Chaney devotes it to a description of scientific measuring instruments, including, of course, electrical and gas measuring standards. For the measurement of current, there are the standard ampère, volt, and ohm, with their sub-standards. The expression "meter," in this connection, now includes a large number of what were formerly regarded as scientific instruments, such as volt-meters, am-meters, &c. Under the Weights and Measures Act, 1889, the Board of Trade have power to cause such new denominations for the measurement of electricity, temperature, pressure, or gravities as appear to them to be required for use in trade, to be made and verified; and under this power the Electrical Standards Committee of 1891 and 1892 was appointed, whose recommendations are given. Indirectly derived from scientific measuring instruments are the standards used in the sale of gas, which are next described by Mr. Chaney; and a plate is given showing the testing-room at the Standards Office. "No practical alteration," we learn, "has taken place in the mode of measuring gas since the standards were made in 1861, excepting in some improvements in detail." There is no standard photometer; but the meter, balance, and pressure-gauge are separately standardized. Nor is there a standard of a burner, "except in some cases of Sugg's 'London' argand burner specified in Local Acts." Where the Board of Trade are required to certify a model of this burner, the stamp of the Standards Office is placed thereon. With regard to a standard of light, the author records that in 1849 a standard candle was recommended by Professor Graham, Dr. Leeson, and Mr. Cooper; and that pentane has now been proposed as a substitute.

In the succeeding section of his book, Mr. Chaney deals with the metric system, and gives tables to facilitate the conversion of weights and measures from and into this system, with a list of the new scientific equivalents. This is followed by a description of the weights and measures used for special purposes, including the sale of coal and coke. All coal has to be sold by weight, unless otherwise determined between buyer and seller. Coke is sold by both measure and weight. That produced in the manufacture of gas is largely sold retail by the chaldron of 36 bushels, "filled in all parts as nearly to the level of the brim

* "Our Weights and Measures. A Practical Treatise on the Standard Weights and Measures in Use in the British Empire; with some Account of the Metric System." By H. J. Chaney. London: Eyre and Spottiswoode; 1897.

as the size and shape of the article will admit"—heaped measure being now illegal. The sale of coal in London and places within 25 miles of the General Post Office is regulated by two Acts passed in 1831 and 1837-8. The former requires that all "coal, cinders, culm, and cannel" are to be sold by weight and not by measure; but a subsequent Act (14 & 15 Vict., cap. 146) provides that, unless repugnant to the context, the word "coal" in the earlier Acts shall include "coal, coke, cinders, and culm." Other measures noticed in this section are gauge measurements and meter gauges. In two appendices will be found a list of the Board of Trade Standards of the Imperial system and representative forms of weighing instruments used in trade.

The book has an appropriate frontispiece showing the entrance to the Pyx Chapel at Westminster, views of the interior of which, as well as of two ancient chests in which the standards, &c., were formerly kept, are given. The text is fully illustrated both by diagrams and plates. It only remains to say that Mr. Chaney has dedicated his work to Sir Courtenay E. Boyle, K.C.B., the Permanent Secretary of the Board of Trade.

OBITUARY.

The death took place suddenly on Sunday, the 17th inst., of Mr. JOHN SILLS CHARLTON, of Mill House, Tonbridge. Deceased was for some years Chairman of the old Local Board of Health, and was a Director of the Tonbridge Gas Company.

We regret to record the death, on the 18th inst., at his residence, Hartley Street, Oldham, of Mr. HENRY SHIMELD, son of Mr. William Shimeld, of Dundalk. Deceased, who had represented Messrs. J. & J. Braddock for more than twenty years, and was for some time Manager of the Gas-Works at Clones, was in his 51st year. He leaves a widow and two sons.

We much regret to record the death, after a brief illness, from typhoid fever, of Mr. GEORGE BARKER, Assistant-Engineer at the Monte Video Gas-Works. Deceased was the youngest son of the late Mr. J. Barker, of Leven, Fife, and was apprenticed to Messrs. H. Balfour and Co. of that town. On completing his term, he accepted an engagement as overseer of the boiler-mounting department of Messrs. Duncan, Stewart, and Co., of Glasgow. He was afterwards for three years with the Sheffield Gas Company, during which time he gained a full certificate for "Gas Manufacture" from the City and Guilds of London Institute. In 1892, he was appointed assistant to Mr. J. Anderson, at Monte Video. His death, at the early age of 29, brings to an untimely close what promised to be a useful and prosperous career; and it is rendered more distressing from the fact that Mr. Barker had been only a few months married.

PERSONAL.

Mr. C. R. BELLAMY, the Lighting Superintendent of the Liverpool Corporation, has been permitted by the Lighting Committee to report upon the works of the Hoylake Gas Company, at the request of one of the Directors.

Mr. W. MONTEITH, retort-house foreman in the gas-works of the Greenock Corporation, has been appointed Assistant-Manager in the works, in succession to Mr. W. Mackie, who was recently appointed Manager of the Port-Glasgow Corporation gas-works.

We recently announced the appointment of Mr. C. VERNON BOYS as one of the Metropolitan Gas Referees, in succession to Professor Rücker. We now learn that, consequent upon this appointment, Mr. Boys has relinquished his position of Assistant-Professor of Physics at the Royal College of Science.

Alderman JAMES CROSLAND, the Chairman of the Huddersfield Corporation Water Committee, has resigned his seat on the Council, of which he has been a member (with the exception of a short interval) since its establishment in 1868. At their meeting last Wednesday, the members passed a resolution thanking Alderman Crosland for his services to the borough, and especially in connection with the water undertaking.

In view of the approaching retirement of Mr. W. HARDIE from the position of Honorary Secretary and Treasurer of the North of England Association of Gas Managers, which he has held since the formation of the Association twenty years ago, it is the intention of the members to specially recognize his valuable services by the presentation of some appropriate testimonial; and the meeting next April has been considered the most appropriate occasion for the purpose. The form which the testimonial will take has not yet been determined.

Coal Mining in the Midlands.—For several months past the Wigan Coal and Iron Company, Limited, have been considering the advisability of sinking one or more pits on the east side of Worksop, on land within a mile of the town. Boring has been proceeded with over various portions of the coal area leased to the Company; and the results have been satisfactory—indicating the course of the coal to be from west to east and south-east. It is hoped and expected that the first sod of a new shaft at Manton will be turned by the Duchess of Newcastle early in May.

WATER BILLS FOR 1897.

(*Continued from p.* 122.)

THE Belfast Water Bill is to extend the district now supplied by the Commissioners. The right of supply of certain places hitherto exercised by the Belfast Guardians is to be transferred to the Commissioners. Additional works are to be constructed, comprising a storage reservoir in the valley of the Anudlong river, and two high-service tanks, to be completed in 20 years. The provisions of the Water-Works Clauses Acts 1847 and 1863, with respect to the laying of pipes and conduits under roads and streets, are to be made applicable to the pipes and conduits of the Commissioners within the city. Additional water capital to the amount of £120,000 is required, to be repayable in 60 years. Persons who use water improperly are to be made answerable for the value of the same, in addition to any penalty they may incur.

The Carnarvon Corporation Bill contains a clause to settle the procedure for the collection of water-rates as part of the general rating of the borough.

The Clydebank and District Water Bill is to incorporate a public Trust for better supplying with water the burgh of Clydebank and its vicinity. The Burgh Commissioners are to be the first Trustees under the Act. The special water supply district is to be abolished, and the works transferred to the new Trust. New works are to be constructed, comprising a reservoir on the Loch Humphrey Burn and the Greenside Burn. Compensation water is to be discharged at the rate of 475,000 gallons per day, in addition to the compensation water mentioned in the Dumbarton Act of 1883. The Trustees are to be bound to afford a domestic supply of water to all residents within 100 yards of their mains. No hose-pipes are to be used without the consent of the Trustees. The sum of £50,000 is to be borrowed for water-works purposes.

The Dublin Corporation Bill is to regulate the supply of the out-townships. The Act is to come into operation on the third Monday after its passing. The out-townships that take an excess of water over their statutory rights are to pay for such excess at the rate of 3½d. per 1000 gallons. The townships are to be empowered to apply for a supply for all purposes, at the uniform price of 2·6d. per 1000 gallons. The Commissioners of Kingstown are to pay interest on a capital sum of £12,500 expended by the Corporation in buying out the Kingstown Water-Works Company and laying a main into the township. All supplies of this nature are to be by meter, under the sole control of the Corporation; and the register of the meter is to be conclusive evidence of the quantity of water delivered, subject to appeal to the Board of Trade. The Commissioners of the townships are to distribute water, but not so as to undersell the Corporation in the city.

The Kingston-upon-Hull Corporation Bill contains a part relating to water. The water undertaking of the Corporation, including the Newington water undertaking transferred to them by the Newington Water Order of 1893, is to be vested in the Corporation. Power is sought for laying water-mains beneath the bed of the River Hull, at or near Stoneferry, for the purpose of carrying the supply to the east side of the river, but so as to always leave a free passage for the navigation. A supply of water for domestic purposes is not to include a supply for baths, horses, or any trade purpose. The domestic water-rate is not to exceed 7 per cent. Provision is be made for the supply of courts by means of standpipes. Extra-domestic supplies are to be by meter, at agreed charges, which are not to be less than the domestic rate. Surplus water profits are to be applied to such purposes as the Corporation shall determine. The Corporation are to supply 50,000 gallons of water a day gratuitously to the Cottingham Urban District Council. The townships of Anlaby, Kirkella, and Willerby are to be supplied on the same terms as are in force in the borough. Various Hull Water-Works Acts and Orders are to be repealed. It is desired to convert the Corporation irredeemable stock into Corporation stock, redeemable not later than 1950. The existing water-works debt is £316,840, which is to be made uniformly repayable within 50 years from April 1, 1898.

The Leicester Corporation Bill contains clauses to extend the water limits so as to include the parishes of Sileby, Syston, Mountsorrel, Rothley, Wanlip, Swithland, Cossington, and Thurmaston North; outlying portions of the undertaking being saleable to the local authorities concerned. The Corporation desire to increase their water capital by £100,000.

The Lowestoft Corporation (Water-Works and Gas-Works Transfer) Bill contemplates the acquisition of the Company's water undertaking. The limits of supply are defined. Surplus water profits are to go to the district fund.

The Pwllheli Corporation Bill contains a part relating to water. The Corporation are to acquire the undertaking of the Water Company upon stated terms. The purchase price is to be £7760, besides the value of the stock-in-trade. The water limits are to be the borough and the parishes of Llangybi and Abererch, in Carnarvonshire. The Company's Order of 1880 is to be repealed. Additional works are to be constructed, comprising a new service reservoir, on land to be acquired within five years. The works are to be completed within ten years. The water supply is not to be constantly laid on under pressure. The rate for domestic supplies is to be 8 per cent.

Besides the sum required for the purchase of the undertaking, the Corporation desire to borrow £12,000 for water purposes, repayable in 60 years. Surplus water profits are to go to the district fund.

The Southampton Corporation Water Bill is to enable the Corporation to acquire the undertaking of the South Hants Water-Works Company, whose authorized capital is £160,000, of which £101,000 has been raised; and there is a mortgage debt of £25,000. The amount of the purchase-money is to be ascertained by arbitration, under the Public Health Act, within six months from the passing of the Act. Redeemable Corporation annuities are to be granted to the shareholders. Additional water-works are to be constructed, comprising a new service tank. The sum of £28,000 is required for water-works purposes. Power is sought for the issue of a new class of 3 per cent. redeemable Corporation stock, at a price not less than 95. Water capital is to be redeemable in 60 years. Surplus water profits are to go to the district fund.

The Tynemouth Corporation (Water) Bill is to enable the Corporation to acquire the undertaking of the North Shields Water-Works Company, who were incorporated in 1786. The present capital of the Company is £60,000, with £37,297 of mortgage debt. The limits of the Bill are the borough and the townships and civil parishes of Whitley, Monkseaton, and Murton. Within six months after the passing of the Act, the Corporation are to give notice to the Company and the Lord of the Manor of their intention to purchase the undertaking, discharged of the due of one-seventh part of the profits payable to the latter under the Act of 1786. In any arbitration to determine the value of the property, the Company and the Lord of the Manor are to be deemed to constitute one party. Power is sought for the Corporation and the Lord of the Manor to enter into mutual arrangements for dealing with the rights of the latter under the Act of 1786. The domestic rate is to be 1s. 6d. in the pound, which is to include two water-closets. Public institutions and schools are only to be supplied on special agreement or by measure. In addition to the purchase price of the undertaking, the Corporation desire to borrow £30,000 for water-works purposes. Surplus water profits are to go towards reducing the rates.

COMMUNICATED ARTICLE.

SULPHATE OF AMMONIA.

By H. H. Cousins, M.A., South-Eastern Agricultural College, Wye.

[*All rights reserved.*]

I.—Its Source.

The last half century has seen most remarkable progress in our knowledge of the nature of plant foods. Since Liebig's historical discoveries in the early forties, each decade has witnessed some fresh application of a hitherto unregarded and waste material for purposes of plant nutrition. It is characteristic of the British farmer that, though openly pooh-poohing the progressive revelations of science as to the economic principles of farming, and ever ready to exalt his vaunted "Practice" to the obvious disadvantage of the proffered "Science," he has yet been shrewd enough to take advantage of the so-called "artificial" manures; and, despite the recent agricultural depression, the British farmer has been able for many years, and still continues, to produce bigger crops per acre than any other agriculturist the world over. To the great gas industry (which, by its waste-products alone, has already laid the foundation of more than one vast sphere of manufacture) the farmer is indebted for the *most concentrated and productive fertilizer* yet placed upon the market. At its present market price, sulphate of ammonia is not only *the cheapest*, but also the *most economical manure* for providing nitrogen to the crops of the farm; and it is particularly important, in view of recent prices, for all farmers, as well as gas managers and others who make and sell this product, to clearly understand its nature and general action on soils and plants. A careful consideration of the principles underlying the economical use of sulphate of ammonia as a manure which this short series of articles is intended to set forth, should, therefore, be of service and profit to all interested in its use in farm and garden.

Its Source and Manufacture.—The pungent odour of burnt beef, the appetizing fragrance of a Welsh rarebit, or the stimulating fumes of burnt feathers, are everyday illustrations of the fact that complicated animal or vegetable products containing nitrogen give off ammonia when strongly heated. Coal, being a substance of vegetable origin, invariably contains a certain proportion of nitrogenous matter as a heritage from the plant substances of primeval forestry. On distillation, coal gives off a considerable amount of this nitrogen in the form of ammonia—in fact, it behaves exactly as meat or cheese under similar conditions. Analysis shows that the nitrogen in coal varies from ½ to as much as 2 per cent.; and the average coal employed in English gas-works would probably contain at least 1·2 per cent. of nitrogen.

The following data will serve to show the variation found in the nitrogen of coal from various sources:—

Source of Coal.	Nitrogen per Cent.
Welsh (Bituminous)	1·24
Northumberland (Bituminous)	0·95
Lancashire	1·25
Cannel (Wigan)	2·12
Cannel (Tyneside)	1·85
Cannel (Scotch)	1·36

The Paris Gas Company recover from 12 to 14 lbs. of ammonia (as sulphate) from each ton of coal distilled; and in English works, where a coal rich in nitrogen is employed, and the liquor well managed, an even higher proportion is readily obtained. The details of the withdrawal of ammonia from crude coal gas, the nature and composition of gas liquor, &c., are matters that need no comment here; but there are two points connected with the working up of the liquor into solid sulphate of ammonia which cannot be too carefully considered in its manufacture.

Purity.—(1) The first point which involves the safe usage of sulphate of ammonia by the farmer under ordinary conditions, is that great care should be taken to guard against using *excess of acid*, and the production of an *acid* salt. If the salt be not neutral, serious injury to a growing crop might readily result from its use. Petermann quotes a case in which he found 16 per cent. of free acid in a sample of English sulphate of ammonia; and it need hardly be said that a product containing even 2 per cent. of free sulphuric acid might readily cause injury to a valuable crop.

(2) The second point which merits the consideration of the manufacturer is that of the complete elimination of the sulphocyanides, which are invariably present in gas liquor. The late Dr. Voelcker asserted that 8 lbs. per acre of ammonia sulphocyanide was enough to completely kill a growing crop. In justice to the makers of sulphate of ammonia, however, it must be said that the bulk of this product as now placed on the English market is not only neutral, and free from excess of sulphuric acid, but is also practically, if not absolutely, free from the poisonous sulphocyanides. It is well to remember that, in the past, great outcries have been raised against the use of sulphate of ammonia by practical men, who had used badly manufactured samples, and had injured their crops in consequence. To ensure confidence, and a free and regular demand for this fertilizer, its purity should be absolutely above reproach, and danger to crops be made a chemical impossibility.

Sale on Guarantee.—Sulphate of ammonia of absolute chemical purity is neither requisite for agricultural purposes nor economically possible to the manufacturer; and I would most strongly urge that all sales be based upon, and be really made on, the actual percentage of ammonia (or nitrogen) in the sample, and not merely "per ton." The practice recently adopted by some manure merchants, of guaranteeing on the invoice a ridiculously low percentage composition, in order to avoid the pains and penalties of the Fertilizers and Feeding Stuffs Act, is not calculated to promote the interests of the trade in chemical manures, and must inevitably arouse suspicion, and lead to the conviction that, despite the Act, "honest" manures are still not the only ones on sale.

Foreseeing far larger and more confident demands for sulphate of ammonia among British farmers and fruit growers in the near and immediate future, it seems to me obvious that (1) sound manufacture, (2) purity, (3) sales on fertilizing value, are three things that would certainly raise the reputation of sulphate of ammonia completely above the nebulous and uncertain status of the mixed manure and the puffed crop-nostrum. The educated farmer—and he will soon be in a vast majority—is steadily learning to avoid the "mixed manure," and to mix his own manurial dressings from the prime constituents at first cost. Give him sulphate of ammonia at its present tempting price, guarantee its practical purity, and sell it on an analytical basis, and he will soon realize that he is getting absolutely the best possible value and return for his money.

Impurities.—Chemically pure sulphate of ammonia contains 25¾ per cent. of ammonia; while the ordinary commercial product averages about 24 to 24½ per cent. if of good quality, and many firms of high standing are accustomed to sell on this basis. Two simple tests, involving no chemical skill, may readily be applied to test the quality of a sample—

(1) If heated to redness, it should volatilize completely. Adulteration with sand or salt is thus readily detected.
(2) Dissolve a dessert-spoonful of the salt in a little warm water, and add a few drops of a solution of chloride of iron. Any red coloration is proof of the presence of poisonous sulphocyanides; and the sample is consequently dangerous to the health of plants.

The remarkable variations in the colour of the commercial article are due to slight traces of tarry matter, or to the quality of the acid employed in the manufacture. Vitriol derived from pyrites contains arsenic, and a yellow tint (due to sulphide of arsenic) is often observed in sulphate made from such acids. Blue or violet tints are due to traces of dyes produced from the tar products present. A reddish tint results from the combined presence of a salt of iron and sulphocyanides. To obtain *colourless* crystals, the French makers employ acid made from pure brimstone.

Annual Production.—Enormous strides have been made both in this country and in France in the annual output of sulphate

of ammonia. The returns for 1870 gave the number of tons manufactured in England as 40,000; but during the next twenty years, this steadily increased, at an average rate of 5000 tons per annum, until 157,000 tons were made and sold in England in 1892, of which 75 per cent. was produced by the gas-works—the remainder being mainly derived from iron and shale works.

TECHNICAL RECORD.

THE EFFECT OF "HOLOPHANE" AND DIFFUSIVE GLOBES ON THE INCANDESCENT GAS-LIGHT.

Herr H. Drehschmidt, of Berlin, has given in a recent number of the "Journal für Gasbeleuchtung" an account of some researches on the distribution of the light of the Welsbach incandescent light, when used without globes, with "Holophane" globes, and with diffusive globes. Professor Wedding had previously stated that the incandescent gas-light was unsuitable for street purposes, because very little of its light was found to be reflected from the pavements and dull-coloured shop-fronts. The impression of darkness which it was charged with producing he attributed to its prevailing green tone; and on the strength of the greater abundance of violet rays in the electric arc light, he asserted that the latter was superior for street lighting. But though the green tint of the Welsbach light may not be altogether guiltless, nevertheless whatever impression of darkness it may produce must be chiefly due to the inadequate distribution of its rays below the horizontal plane. Reflectors like those fitted to lanterns in the Stralauerstrasse, Berlin, have been of little service in remedying this defect, as, in order to permit of the removal of chimneys for cleaning, they must be placed too high above the burner.

Herr Drehschmidt's researches were carried out in the laboratory of the Municipal gas-works. A radial photometer, by which the light at any angle between 80° above and 90° below the horizontal plane could be measured, was employed. To eliminate the effect of depreciation in luminosity of the mantle by continued use, the illuminating power throughout the experiments was calculated to a percentage of the horizontal power of the light without a globe at the time of each observation. The incandescent light, without globe or reflector, showed a constant decrease in intensity from the horizontal plane downwards, until vertically beneath the burner the illuminating power was only 0·4 per cent. of the horizontal power. There was a similar, but less marked, decrease in power above the horizontal plane. One-third of the whole light emitted was found to be radiated in the zone between the horizontal plane and 30° above it; and it is this large proportion that the street-lantern reflectors fail to utilize, as they cannot be placed sufficiently low to catch rays so nearly horizontal. The quantity of light radiated on any zone of a sphere, when the burner is considered to be at the centre of a sphere of radius=1, was calculated according to the following equation:—

$$Q = r^2\pi \ (\sin. a_2 - \sin. a_1) \ (i_1 + i_2)$$

in which a_1 a_2 were the limiting angles, and i_1 i_2 the intensities respectively of the light at those angles.

Less light was found to be distributed below than above the horizontal plane. This fact does not appear strange when the shape acquired by the mantle is borne in mind, as the light from the narrowed upper portion is obstructed in its passage downwards by the wide lower portion of the mantle. The mean spherical intensity of the Welsbach light was found to be 76 per cent. of its horizontal intensity. For the experiments, five globes of different patterns were obtained from the French "Holophane" Company through their agents. Three diffusive globes made by an English house, and one by a Berlin firm, were also obtained. The five "Holophane" globes were grooved vertically on the inside and horizontally on the outside surfaces. The diffusive globes were grooved horizontally on the outside only. The intensity of light with each globe was ascertained in terms of the horizontal intensity of the unscreened light, at intervals of 10° from 90° below to 80° above the horizontal plane. The quantity of light distributed over each intervening zone covered by an angle of 10° was then calculated according to the formula already given. The results were carefully tabulated, and the total quantity of light reckoned.

The "Holophane" globes gave more light below than above the horizontal plane; thus practically inverting the results with the light without a globe. One tulip pattern globe 150 mm. (5·90 inches) high, 135 mm. (5·31 inches) wide, and with the upper opening 125 mm. (4·92 inches) and the lower one 56 mm. (2·2 inches), increased the light below the horizontal plane by 29 per cent. The other "Holophane" globes augmented the light below the horizontal plane by 17·2 to 26·9 per cent. On the other hand, the light above that plane was diminished by from 28·5 to 42 per cent. The loss of light by absorption and reflection was found to be only 7·7 to 9·8 per cent.

The diffusive globes diminished the total amount of light below the horizontal plane by from 1·2 to 23·5 per cent.; but they concentrated it on a small space almost vertically below the burner, or, more precisely, on the surface below the burner enclosed between the angles of 60° and 90° to the horizontal plane. The maximum intensity was found at an angle of about 80°; and with the Berlin globe it was 1·2 times, and with the remaining three globes 2·4, 3·2, and 4·2 times the horizontal intensity of the light without a globe. The light distributed laterally was much diminished by the diffusive globes. The total loss of light was greater than with the "Holophane" globes; amounting to 9·4 to 16·9 per cent. of the total light. Both these and the diffusive globes lessened the total light above the horizontal plane—the former globes to the greatest extent.

These researches showed that the diffusive globes could only be used with any advantage for strongly illuminating a small surface almost directly below the burner, as would be required for shop-windows, counters, &c. By employing a reflector or white opal shade, the light cast upwards might be utilized for raising still further the illumination below. The more effective diffusive globes are costly. The less efficient one made in Berlin is very suitable, if provided with a reflector or opal shade, for lighting writing-tables, &c., and is cheap. The "Holophane" globes illuminate large spaces uniformly; and the use of the above-described tulip-pattern globe, for instance, for street lighting promises to answer well, provided there is no technical difficulty in fitting it in the lanterns in such a manner that it can be readily removed for cleaning. For street lighting, the globes should be supplemented by reflectors, in order to utilize as much as possible the light radiated upwards.

THE WATER SUPPLY OF SMALL TOWNS AND RURAL DISTRICTS.

At one of the Meetings of the Society of Engineers before the last summer vacation, a paper on the above subject was read by Mr. Percy Griffith, Assoc.M.Inst.C.E., a member of the Council of the Society. As the author, who was associated with the late Mr. Jabez Church, M.Inst.C.E., F.G.S., has had special experience in connection with this department of water engineering, we give some extracts from the paper.

While a considerable amount of information has been published in various forms respecting water-works generally and large works in particular, there appears to be a remarkable absence of published matter relating to small water-works exclusively. There are apparently two reasons for this—viz., (1) that small works are generally considered too insignificant for individual and special attention; and (2) that theories and experience gained in connection with large works are supposed to be ample guidance to anyone carrying out smaller works. The author has been associated for the past eight or ten years with the design and construction of the latter class of works, and is of opinion that they are not too insignificant to be worth studying; and moreover he is convinced that a distinct and unique experience may be gained from the study of them. The present paper has been limited to the consideration of features specifically applicable to works supplying a maximum population of 10,000; and the author first proposes to show several points in which both theory and practice as applied to large undertakings are quite distinct from those applicable to small ones.

The first and most conspicuous of these is the length of distributing mains required with a small and scattered population. This is often so considerable that the pumping-station or impounding works cost but a small fraction of the total outlay. To give an example of this: Supposing a trunk main to be five miles long, to have a head of 150 feet, and to be supplying a population of 5000 people. Allowing 25 gallons per head per day, or a total supply of 125,000 gallons per day, it will be necessary to provide for a maximum flow of at least 11,500 gallons per hour. To do this, the main must be 6 inches in diameter; and the cost of laying five miles would be from £3000 to £3500, equal to 12s. to 14s. per head for this one item alone. This, however, presumes that the main nowhere rises above the mean hydraulic gradient—a condition not always obtainable, especially in hilly districts. A very slight rise above the mean gradient towards the end of the main will necessitate a very serious increase in the size of the main throughout. The author has known a case where a gross head of about 100 feet was almost entirely absorbed—that is, that very little water was got through the main at all, owing to its having to traverse some high ground quite near the district of supply, and some seven or eight miles from the reservoir. From these instances only, it will be seen that the question of the trunk main is a very serious one in rural districts where the undertakings are small and heavy capital outlay is impossible, or at any rate objectionable.

Another important feature in the financial aspect of small water undertakings is the distribution of the capital outlay over limited populations, involving as it does comparatively heavy rates. Added to this, future extensions must be provided for in the sizes of mains and plant. Frequently, too, the actual anticipated increase in the demand is delayed for many years, owing either to the existence of private wells or to local opposition or other causes. Where this is the case, a large portion of the capital outlay is kept idle during long periods; and the necessary charges for interest and repayment of loans must either be borne by a small number of consumers, or be levied in the ordinary rate on the district generally—a proceeding only

open to local authorities, and not altogether justifiable even then. In both cases, it follows that rates for domestic water supplies in country districts are necessarily higher than in large towns. Further reasons for this are found in the absence of trade supplies, and in the low rateable value of house property.

Reverting to the question of mains, it must be observed that, while these are not subject to heavy wear and tear like machinery, they are still liable to many risks and expenses in country districts which do not exist, or else are so small as to be of no practical importance, in large towns. For example, the presence of air in the higher parts, or, if air-valves are used, the contamination or loss of water through their becoming choked or fouled; the deposit of sediment or rust (according to the character of the water); and fracture due to frost or injury by steam-rollers, traction-engines, &c. These dangers involve the necessity of frequent examination and repairs. A broken trunk main also means the stoppage of the whole supply, the loss of a great quantity of water, and the repair of a road which may be half washed away by the time the fracture is discovered and the water shut off at the nearest valve. To many who have been connected with large undertakings, where such contingencies are provided for by elaborate precautions, such difficulties may seem trivial and unimportant; but with a small country works, it is impossible to provide enough valves, or to lay mains at a sufficient depth, or to arrange for continuous inspection of them for this purpose, without unduly increasing the cost of the undertaking or the working expenses. It must therefore be considered an unavoidable necessity that rural water supplies are proportionately far more costly, both in erection and maintenance, than undertakings supplying larger and more concentrated populations.

There is one other point which may be noticed in passing, and that is the difficulty of designing works so that, while the first cost is not unduly heavy, considering all the circumstances just referred to, they are equal to the possible maximum demand during a given period of (say) five or ten years, and capable of easy and economical extension as the demand increases. A boring may be deep enough to yield sufficient water for the maximum demand of the first five or even ten years. But when this has been reached, it is necessary to make a new boring, and thus increase the capital account very heavily; whereas if the first boring is continued until the increase of twenty or thirty years is provided for, the undertaking may be crippled in its earliest years by a too heavy first cost. In this respect, as well as many others which need not be detailed, rural water-works may require as much, and often more, foresight and judgment than the supply of a large city, where the future increase can be calculated from the statistics of previous years.

The author has been led to consider the subject of the ownership of water undertakings (which at first sight appears to be beyond the scope of an engineer's duties) owing to the frequency with which the services of engineers are required to make valuations of water-works with a view to their purchase by local authorities. The Water-Works Clauses Act, 1847, contains practically no provision for the purchase or the construction of water-works by local authorities as at that time constituted. Such an action, previous to the passing of the Public Health Act in 1875, involved the appointment of special commissioners to deal with the matter, and with that only. This Act, however, largely extended the powers of local authorities in this direction; and since that date, the municipalization of water-works has, in the case of the larger towns, become general—the Metropolis standing alone as a striking exception. With the recent creation of Parish and District Councils, and the facilities for such action now given to these bodies, a rapid extension of the practice may be expected among smaller undertakings.

The advantages of ownership by a local authority may be briefly stated as follows:—

1.—A local authority elected entirely from residents in the district of supply has a greater personal interest in the matter of water supply, and is better qualified to administer the undertaking in the interest of the consumers, than a board of directors, of whom only a few, and possibly none, have any personal connection with, or other interest in, the neighbourhood.

2.—A local authority does not have to earn a dividend, and has only a very low rate of interest to pay on loans; consequently the charges for water can presumably be much reduced where the undertaking is in their hands.

3.—Public sentiment, which says that an article so universally necessary to life and health should be provided by the public themselves through their elected representatives entirely free from the element of vested interests or private monopoly.

These arguments are so generally taken as conclusive, that the author proposes to submit a few on the other side. It is not universally the case that the transfer of the undertaking to the local authority is followed by a reduction in the rates. This sometimes appears to be the case when it is really not so, as, for instance, when a deficiency of income is made up from the general rates. The deficiency is due in most cases to the charges for interest and repayment of loans having to be added in the working expenses—an unavoidable condition which seriously handicaps all small local authorities who undertake the management of public works, and one which the author considers of great importance.

There is another element on the financial side of the question—viz., the actual basis for the valuation of existing works. However justly this valuation may be carried out, allowance has to be made in all cases for compulsory purchase; and this is bound to affect the amount of interest and loan to be paid year by year. The whole question of valuation is, however, so complex that a paper might well be devoted to it alone. The author will therefore simply mention what seems to him to be a most important and essential consideration to which engineers should never fail to give adequate attention—viz., that if, after a price has been decided upon which is fair and just to the company whose works it is proposed to purchase, it appears to be likely, or even possible, that the undertaking cannot, for any of the reasons the author has indicated, be managed as economically, alike to consumers and ratepayers, by the local authority as by the company, then the engineer should make this clear in his award, and advise his clients accordingly.

With regard to matters of management, the author has had some opportunities of comparing local authorities' and companies' undertakings. The chief difficulties in the former case appear to be—

1.—The periodical changes in constitution, which often interfere with continuity of policy.

2.—A liability to influence from political bias.

3.—The necessary ignorance of technical questions of men elected at short intervals from the private or business residents of the neighbourhood.

On the other hand, a board of directors is more or less permanent in its constitution; and while its policy is thereby secured an element of continuity otherwise impossible, at the same time its members have an opportunity of becoming well versed in such technical questions as may come before them. The author believes that these remarks will be endorsed alike by members of local authorities and by engineers, though it must be clearly understood that they are applied strictly to the smaller undertakings, and not necessarily to those of large towns and cities.

The subject of charging by meter or by rate was very thoroughly treated and discussed in connection with the late Mr. Gill's paper on the water supply of Berlin, read before the Institution of Civil Engineers in December, 1891. The author of the present paper, therefore, will confine his attention to its relationship to small towns or rural districts. The general conclusion pointed to by the discussion of Mr. Gill's paper was that a universal meter system was only applicable to large towns with specially concentrated populations, where one meter could serve for several consumers, and where circumstances generally were in favour of the system. One speaker, however—viz., Mr. Winship, the Engineer and Surveyor to the then Local Board of Abingdon—gave the results of an experiment he had made with the meter system in his town (containing a population of 7000 inhabitants only), which seemed to point to an opposite conclusion. In this case, the experiment has been perfectly successful; and the reasons are, no doubt, to be found in the following facts: First, there are only 350 meters to 858 houses, or an average of 2·45 services to each meter; secondly, the public supply is largely supplemented from private wells; thirdly, the population appears to be fairly concentrated, being at the rate of 11,200 per square mile (a very high figure for towns of this size); and, finally, the public supply only extends to 54 per cent. of the total population.

The author has also obtained the following particulars from Mr. Palmer, the Engineer and Surveyor to the Local Authority of Malvern, relating to the water supply of that town, which is carried on under a meter system: The population supplied is 6000, with 600 meter services. The quantity delivered in 1893 was 12 million gallons, or 5½ gallons per head per day—all for domestic purposes. The population is fairly distributed; being at the rate of about 3000 per square mile. There are, however, 400 private wells in use, of which 200 are owned by consumers of the public supply; so that a considerable quantity of water is used beyond that passing through the meters. On the whole, therefore, the circumstances are somewhat similar to those at Abingdon; and it may be safely concluded that in these lies the success of the system.

Statistics collected by the author, and appended to his paper, show that, on the question of finance alone, the meter system is not at all difficult of application, if other circumstances are favourable. But the ordinary conditions under which small water undertakings are worked render it unsuitable and objectionable in many ways. The chief objection is that an auxiliary private or gratuitous supply for sanitary purposes appears to be essential. This is seldom to be found in sufficient quantity; and even when found, there must always be the risk of people drinking the impure well water, which costs them nothing, in preference to the purer supply of which every gallon is registered against them. A good deal more might, no doubt, be said on both sides of this question; but the author thinks that his conclusions are so generally accepted, that any further remarks are unnecessary.

Turning to the constructional features of small water-works, the author would like to refer to a paper by Mr. T. S. Stooke, Assoc.M.Inst.C.E., appearing in Vol. LXI. of the Proceedings of the Institution of Civil Engineers, which described pumping plant erected under his direction at a stone quarry near

St. Helen's. The most remarkable feature of this was the fixing of the pump in a boring; thus dispensing with a well. At the time the work was carried out this was, Mr. Stooke says, "a somewhat novel form of procedure;" and when the expense of it is borne in mind, the author considers it to have been not only novel but remarkable. The whole plant cost less than £1000; and the supply obtained was 140,000 gallons a day. Allowing 25 gallons per head per day, this was sufficient for the domestic and ordinary trade supply to a population of 5600; and the cost works out to only 3s. 6·72d. per head. Though this work did not include a service reservoir or any considerable length of distributing-mains, the cost is sufficiently low to make it worth while considering how it was carried out so cheaply, and whether such a system is capable of more general application. In recent years, this system has been adopted for larger works, conspicuously at Widnes (also in Lancashire), where two large borings side by side have a pump in each, driven by a large horizontal direct-acting engine; and again, the works now in progress at Gainsborough, in Lincolnshire, are designed on the same principle—the late Mr. Jabez Church being the Engineer.

There are, however, one or two points which have to be considered in connection with this system. First, the borehole must be perfectly straight and plumb, or there will be a great deal of unnecessary wear on the pump. This is itself a matter of difficulty, and requires great care in sinking. Then, in case of breakdown, and whenever the buckets or glands want repacking, the whole pump must be lifted to the surface. If used for a public water supply, this involves the complete stoppage of pumping until the repairs are complete; unless, indeed, the boreholes and pumps are in duplicate, in which case the cost of construction would be greatly increased. Finally, a well gives some advantage in the way of storage which a boring cannot do, and which is very important in cases where the yield is only barely sufficient for the requirements of the district. In spite of these points, the author considers the system to be an excellent one, assuming proper precautions are taken in designing the works.

One of the greatest difficulties met with in designing small pumping machinery is the necessity for working it at comparatively slow speeds—involving the use of unsightly, noisy, and expensive gearing. While dealing with boreholes, reference may be made to a system adopted by Mr. A. T. Matthews, of Manchester, for getting over this difficulty. This consists in immersing the pump-bucket some distance under water; dispensing altogether with the bottom or suction valve, and dividing the work between the up and down strokes by means of a ram half the area of the bucket. If, in addition to this, the rods be balanced by counter-weights cast on the fly-wheel of the engine, or in any other convenient way, the pump can be worked at considerable speed without loss of efficiency; and thus gearing may be dispensed with. The only difficulty which the author sees in this is the balancing of the pump-rods with some means of automatic adjustment according to the varying depth of water in the borehole. Without some such arrangement, the balance would be lost directly the immersion of the rods became either greater or less than that provided for.

The author then called attention to two peculiar designs of pumps—one intended to overcome the necessity for gearing between the engine and the pump; and the other (applicable only to deep-well pumps) to provide for re-packing the bucket without lifting it out of the barrel. The first was invented by Mr. Arthur Rigg; and the second, by Messrs. F. Pearn and Co., of Manchester. He then proceeded to cite various works which appeared to possess features of interest or to illustrate the present practice of water-works engineering for small town and rural districts. Among these were the works at Halstead, Essex, erected in 1889-90 from the designs of the late Mr. Jabez Church. These were described by the author in a paper read before the British Association of Water-Works Engineers at their first annual meeting in July, and included in our report of the proceedings (see *ante*, p. 315). The other works mentioned may be left for notice on a future occasion.

Mr. W. J. Dibdin on the London Water Supply.—A special meeting of the London Section of the Society of Chemical Industry was held on Monday evening last week, to hear a paper by Mr. W. J. Dibdin, F.I C., F.C.S., the Chemist to the London County Council, on "The Character of the London Water Supply." As this was the only business announced for the meeting, members and many visitors specially interested in the subject of the paper were much surprised and annoyed to find nearly an hour at the commencement of the proceedings given up to an acrimonious controversy between two members on a totally different matter. The result of this was that Mr. Dibdin was much hurried in the reading of his paper when it eventually came on; and those who essayed to discuss it were asked to curtail their remarks to an unreasonable extent. The meeting finally decided to adjourn further discussion and the author's reply to the next meeting of the Society. In view of this, we hold over our abstract of the paper—the main object of which, the author explained, was to point out certain improved methods employed by him in the course of a series of daily analyses which he had been called upon to make of the water supplied to the Metropolis—until it can be given with notes of the complete discussion.

REGISTER OF PATENTS.

Coin-Freed Fluid Meters.—Hollanders, E., of Southsea, Leather, C. J., of Portsmouth, and Taylor, T., of Southsea. No. 519; Jan. 8, 1896.

This invention relates to coin-freed fluid meters such as those described in patent No. 17,621 of 1895. The main objects of the present invention are to provide such apparatus (1) with means whereby it can be rapidly altered, so as to be adaptable for the reception of, and to be operated by, different sized coins, and the consequent delivery of a quantity of fluid of equivalent value; (2) with means for causing the termination of the supply of the determined quantity to be shut off gradually; and (3) with means for preventing fraudulent tampering with the mechanism.

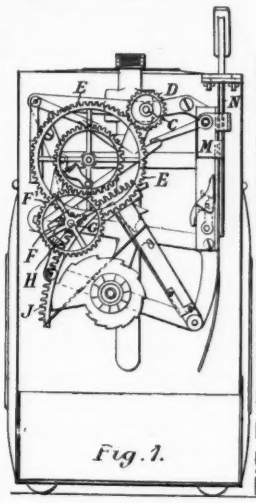


Fig. 1.

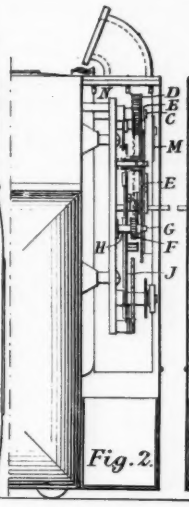


Fig. 2.

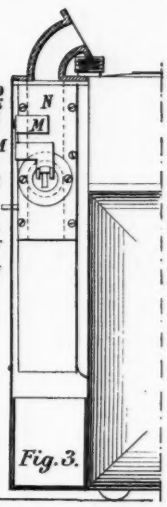


Fig. 3.

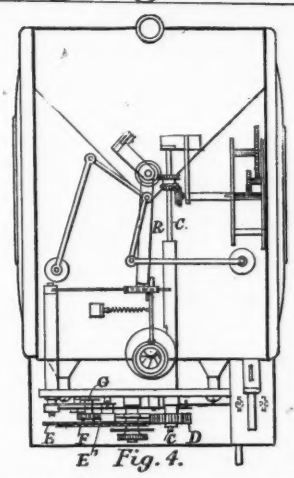


Fig. 4.

Fig. 1 is a sectional side elevation of a meter fitted with the coin-freed apparatus described in the 1895 patent, and having the present improvements adapted thereto. Fig. 2 is a fragment of a rear elevation, with a part section. Fig. 3 is a fragment of a front elevation, with a part section. Fig. 4 is a plan of fig. 1, with the top of the meter removed.

To carry out the first part of the present invention, the patentees mount a wide pinion D on the main shaft C, which latter takes its motion from the registering shaft of the meter, by means of the worm gearing shown in fig. 4. With this pinion D gears a toothed wheel E, to the face of which is rigidly secured a smaller toothed wheel E. This compound toothed wheel is fast to a sleeve sliding longitudinally on an axle provided with two notches (see fig. 2). To the face of the wheel is pivoted a catch, which can be made to engage with one or other of the notches; and the wheel is thus locked in the position to which it has been brought on the axle. The separate wheels of the compound wheel gear respectively with the toothed wheels F and F^1 (figs. 1 and 2), both of which are fast on the shaft G, which latter carries the single toothed lantern-pinion H, for causing the rack J to advance one tooth for every revolution of the shaft. In the position shown in figs. 1 and 2, the motion of the main shaft is transmitted through the wheels D, E, E^1, and F^1, to the shaft G. To change the gear, the catch is removed from the forward notch on the axle, and the sleeve slid back until the catch is in position to engage the rear notch. It is then locked therein. The wheel E is now still in gear with the wide pinion D; but the wheel E^1 is out of gear with the wheel F^1, and the wheel E is in gear with the wheel F. Consequently the motion will be transmitted from the main shaft C to the shaft G, through the wheels D, E, and F. In fig. 2, the first position is shown in full lines, and the second position in dotted lines.

The gear wheels and the changes thereof are adapted to correspond with the changes which may be effected in the coin-shoot for the purpose of adapting it (in the manner to be explained) for receiving and causing the mechanism to be properly operated by coins of different sizes. The coin-shoot N is provided with a removable top section,

secured on the upper end of the coin-shoot. The top section has a coin-slit, of a size to admit the requisite coin; and the top sections are all so made as to be interchangeably fitted to the flange of the coin-shoot, as in fig. 1. In the bottom of the coin-shoot is a perforated disc, which is removably secured, so that, when desired, the disc may be removed and another substituted having a different sized perforation or central aperture corresponding in size with the coin-slit in the top removable section. In fig. 3, the apertured disc is adapted for (say) a sixpence; but the way in the body of the shoot through which the coin falls to the apertured disc is made of a size to take the largest coin, and all the perforated discs for smaller coins are furnished with side blocks on the rear, curved on their edges towards the centre of the perforated disc, so as to partially block up and contract the way leading from the coin-shoot to the apertured disc, and thus form a seat whereon the coin is held on its peripbery by the arm of the bell-crank lever M.

In order to effect the change so as to adapt the apparatus to work with different sized coins, it is constructed to take the largest sized coin (say, a penny); and a top removable section having a coin-slit to take this sized coin is secured on to the flange on the top of the coin-shoot. A disc, having an aperture just large enough to allow a penny to pass through it, is secured in the bottom of the coin-shoot; and the gear-wheels are put back to, and locked in, the dotted position shown in fig. 2. The mechanism is then boxed in, and is ready, on the insertion of pennies, to deliver fluid; the motion of the shaft C being transmitted through the gear D, E, F. To make the apparatus adaptable to deliver fluid of the value of (say) sixpence, the top removable section is replaced by another having a slit of the size of a sixpence; the apertured disc is replaced by one having an aperture just large enough to allow of a sixpence being pushed through; and, as shown in fig. 3, having side blocks which contract the way of the shoot, and form a seat holding the coin centrally behind the aperture. The gear is then changed into the position shown by the full lines in fig. 2; and the motion of C is then transmitted through the reducing gear D, E, E^1, and F^1. The gear being now one-sixth is ready, on the insertion of a sixpence, to deliver six times the quantity of fluid that was delivered in exchange for a penny in the former gear.

To carry out the second part of the invention, a spring is connected to the shut-off valve in such a way that the shut-off is effected against its power. On referring to fig. 4, it will be seen that the rod which, at the proper time for opening or shutting off the supply of gas, is partially rotated by the coin-freed mechanism in the manner described in the 1895 patent, is provided with a rigid arm, on which slides a sleeve having a nose projection or catch. When the rod is brought into the shut-off position, this catch lies in the path of the radial arm R, which is fast on the registering shaft, and which, at its next rotation, abuts against the catch, and slides the sleeve to which the catch is connected along the arm until such a position is reached that a rear projection on the sleeve abuts against the arm of the valve-spindle. Whereupon the arm partakes of the movement of the radial arm R, and the valve is gradually shut off against the pressure of the spring, one end of which is secured to the arm, and the other end to a fixed part of the meter. The power of the spring will determine the length of time during which the shut-off is effected. When, at the proper time, the rod is brought to the "valve open" position, the catch is removed from the path of the radial arm R, which is then free to rotate; and the rear projection is simultaneously removed from the path of the valve-spindle arm. Thereupon the spring operates, and the valve opens; and the meter goes on passing gas until the supply is again shut off.

To carry out the third part of the invention, the patentees propose to fork the end of the arm of the bell-crank lever arrangement M, between which arm and the nose of the rack J, the coin forms a connecting link. The part which lies between the prongs of this fork is bevelled off and sharpened, as shown in figs. 1 and 3, so that it forms an edge which will cut a piece of string or like material secured to a coin inserted in the shoot N, as the coin is being pushed out through the aperture.

Incandescence Bodies for Gas-Burners.—Wheatley, W. H.; a communication from F. Woernle, of Stuttgart, Germany. No. 1681; Jan. 23, 1896.

The formulæ of two solutions are given, both of which are said "to give excellent results in practice." They are—

No. 1.—Thorium nitrate, 12 parts; erbium nitrate, 2·5 parts; zirconium nitrate, 9 parts; and magnesia nitrate, 1·25 parts.

No. 2.—Zirconium nitrate, 12·25 parts; erbium nitrate, 9 parts; thorium nitrate, 2·5 parts; and strontium nitrate, 1·25 parts.

Incandescence Bodies for Gas-Burners.—Wheatley, W. H.; a communication from C. Schmid, of Brussels. No. 1682; Jan. 23, 1896.

"Excellent results" are said to be given by their use as an impregnating material for mantles or hoods for incandescence gas-burners, of solutions made according to either of the following formulæ:—

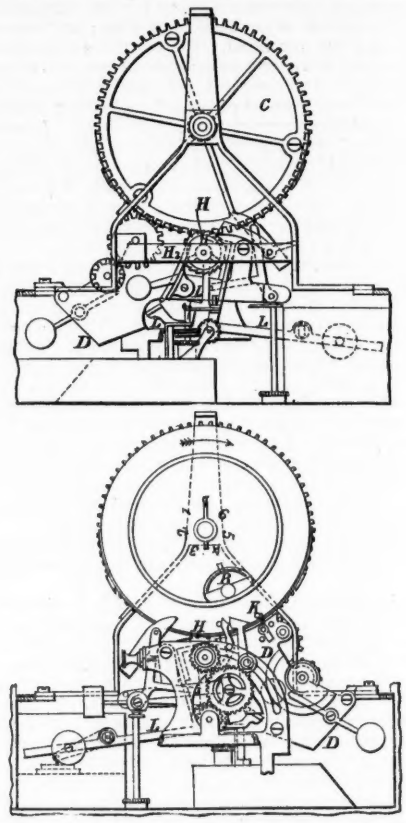
No. 1.—Magnesia, 4 parts; zirconium nitrate, 85 parts; aluminium nitrate, 4 parts; erbium nitrate, 4 parts; strontium nitrate, 2 parts; and didymium nitrate, 1 part.

No. 2.—Magnesia, 1·25 parts; zirconium nitrate, 12·5 parts; strontium nitrate, 1·25 parts; erbium nitrate, 10 parts; and didymium nitrate, 0·25 part.

Coin-Prepayment Mechanism for Gas-Meters.—Blackie, D., of Edinburgh. No. 3930; Feb. 21, 1896.

Front and back sectional elevations of this coin-prepayment mechanism for gas-meters will indicate the main features of the invention.

The mechanism is actuated partly by the insertion of a penny B in an outlet formed in an outer disc or plate, carried on a spindle in a bracket fixed to the meter-casing. An inner disc on the same spindle has on its face a number of radial arms; and the periphery of the two discs is encircled by a fixed ring, having an opening from which a shoot D leads to a receptacle for the pennies. The space between the two discs forms a kind of box, divided into pockets by radial arms so shaped that each pocket can hold one penny. A spring catch on the inside of the outer disc bears on the outer end of one of the radial arms on the inner disc, and prevents the outer one from being turned unless when the catch is depressed by the insertion of a penny in the inlet; the inner disc being prevented from turning by a ratchet-wheel H and pawl, except when the meter is delivering gas. The inlet is so shaped that, as stated, the insertion of a penny depresses and releases the spring catch; the penny, when pressed fully in, resting in one of the pockets formed for it by the radial arms. The outer disc can



now be turned, by means of a handle, until the spring catch encounters a second radial arm, forming part of a second pocket, and then the catch can be again released by the insertion of a second penny; and so on for a complete revolution, until all the pockets are occupied by pennies if desired, when the disc is prevented from being turned further by encountering a stop. The outer disc is made with a dial; and a pointer on the spindle carrying the disc indicates the number of pennies in the pockets. The first pocket is at the shoot; and on the spring catch being released and the outer disc turned, the penny falls into the shoot and encounters one end of a lever L, which opens the gas-supply valve. The opening of the valve is further insured by a pin K, so placed on the face of the outer disc that, on first turning that disc, it encounters a trigger-lever, which also acts on the lever actuating the gas-supply valve. From the spindle operating the ordinary indicating dial mechanism, spur-wheel gearing turns a cam, which acts on a stop-pin crossing the shoot, and withdraws the pin at the proper time, according to the amount of gas allowed for each penny—permitting the penny to then fall down into the receptacle provided for it. On the spindle carrying the cam, there is an arm which enters the shoot, and insures the removal of each penny should it stick from any cause. A second cam, on a spindle carrying part of the spur-wheel gearing also acts on the lever, and actuates the gas-supply valve, so as to insure that valve being kept open the proper length of time. Part of the spur-wheel gearing is carried on a bracket, capable of adjustment in order to permit of the wheels being changed in the event of the price of gas being altered at any time.

The meter having started to work, the two discs are turned forward by a pinion, fixed on the spindle carrying the second cam, and acting on a spur-wheel fixed on the back of the inner disc; this forward motion being transmitted to the outer disc by the spring catch being in contact with one of the radial arms. The pennies drop in their turn down the shoot, after each has acted (like the first) in keeping the gas-supply valve open. An extra dial is provided, to show the number of feet of gas being consumed during the action of each penny. When all the pennies have passed into the receptacle, the two discs will have been turned back to about the starting position. The valve is thereupon closed by the action of a counterweight on the lever; and to insure that the valve is properly closed, a pin on the face of the outer disc also encounters a lever, which acts on the gas-supply valve lever—the action of the mechanism being thereby stopped.

What is claimed as an important feature of the mechanism, is that no money falls into, nor can be removed from, the receptacle, until the gas paid for has been all (or nearly all) consumed; the advantage of this being that the amount of money in the receptacle when collected will correspond with the gas consumed, as indicated by the dial.

Incandescence Mantles for Gas-Burners.—Nicholls, W., of Holborn, W.C. No. 4000; Feb. 21, 1896.

The formula of the solution to which this invention relates, and which the patentee says he has found to give excellent results in

practice, is as follows: Zirconium nitrate, 55 parts; Calcium nitrate, 45 parts; Yttrium nitrate, 3 parts; and Uranium nitrate, 0·5 part. The hood or mantle (made of any suitable fabric to the desired form) is saturated in an aqueous solution according to this formula, and dried in the ordinary manner, when it is fit for use. The first application of a flame consumes the fibrous constituent, and leaves only the frame or skeleton of metallic oxides remaining.

Electric Gas-Lighting Devices.—Morstein, O. von, of Schoeneberg, Germany. No. 9402; May 4, 1896.

This invention relates to an improvement in the electric gas igniting and extinguishing devices described in patent No. 4670 of 1895, in which an electro magnetic gas-cock opener is connected with a spark inductor (secondary current), or with glow wires, in the same circuit. The improvement consists in so arranging that, after the gas-cock has been opened, the opening electro magnet is cut out of circuit automatically; so that the battery current then passes through the igniting arrangement only.

Incandescent Gas Lamps and Burners.—Crowe, R., of Liverpool. No. 19,889; Sept. 9, 1896.

This invention relates to a detachable "sieve," constructed to close around and cover the air-ingress apertures of the air and gas mixing chamber of incandescent gas-burners, whereby flocculent dust and the like is intercepted, and prevented from entering the chamber. The sieve is made so as to be capable of easy removal, and readily freed from dust.

APPLICATIONS FOR LETTERS PATENT.

708.—Maccallum, P. F., "Internal combustion engines." Jan. 11.
746.—Gautier, C., and Wehrle, X., "Carburetting apparatus." Jan. 11.
749.—Gritton, W. H., and Sheridan, H. B., "Lighting and extinguishing gas-jets by means of electricity." Jan. 11.
773.—Simpson, W. M., "Gas-stoves." Jan. 12.
806.—Hamilton, J. H., "Gas and oil engines." Jan. 12.
831.—Robson, H. J., "Heating or cooling gas and other fluids." Jan. 12.
846.—Stevens, L. B., "Automatic bye-pass or governor for gas electrically controlled." Jan. 12.
879.—Helps, J. W., "Water-level indicators or liquid gauges." Jan. 12.
885.—Holliday, T., "Production, storing, and application of acetylene gas." Jan. 12.
905.—Boult, A. J., "Supplying gas to, lighting, and extinguishing gas-burners and the like." A communication from B. Jolles. Jan. 12.
911.—Daix, V., "Production of acetylene gas." Jan. 13.
916.—Jackson, J., "Incandescent gas globes and chimneys." Jan. 13.
955.—Grossard, G., and Peychiers, E., "Production of acetylene gas." Jan. 13.
992.—Mills, J., "Measuring and delivering liquids." Jan. 13.
1011.—Wimshurst, J. E., "Gas and vapour engines." Jan. 14.
1014.—Bautz, A. E., "Gas cooking apparatus." Jan. 14.
1027.—Rowbotham, W., "Explosion engines." Jan. 14.
1031.—MacDonald, J. M., "Deflecting light from lamps." Jan 14.
1058.—Claus, C. F., "Automatically igniting and extinguishing gas-lights." Jan. 14.
1078.—Harvey, W. H., "Anti-shock fittings for incandescent gas-burners." Jan. 15.
1122.—Wilson, G., "Prepayment mechanism for gas-meters." Jan. 15.
1140.—Lothammer, F. J., "High-pressure steam and gas generators." Jan. 15.
1153.—Des Essards, E. H. F., "Acetylene gas generator." Jan. 15.
1160.—Lake, H. H., "Gas and petroleum engines." A communication from La Société A. Fritscher et Houdry. Jan. 15.
1166.—Martini, A., and Werck, W., "Incandescent gas-burners." Jan. 15.
1186.—Wren, A., "Anti-vibration globe and (or) support for incandescent gas-lamps." Jan. 16.
1189.—Pease, E. L., and Ashmore, Benson, Pease and Co., Limited, "Method of, or means for, carrying out the operation of enlarging gasholders." Jan. 16.
1240.—Ross, F. E., and Gibson, A. J., "Production of gas from towns' refuse and sewage sludge." Jan. 16.
1252.—De Schodt, P. G., "Improvements in, and relating to, lighting and heating systems by means of gas, mineral oil, and the like." Jan. 16.

Explosion of a Station-Meter at Redcar Gas-Works.—A serious explosion occurred in the meter-house at the Redcar Gas-Works on Tuesday last. Messrs. J. Milne and Son, of Edinburgh, have lately erected a 20,000 cubic feet cylindrical station-meter, which had been connected up and the valves closed, awaiting the arrival of Messrs. Milne's workman to start it according to the contract. He commenced work at 7.20 on Tuesday morning, using a lighted candle. All went well until 8.40 a.m., when the meter exploded. Both ends were blown out, and the new building in which it had been erected was wrecked. One of the Gas Company's men had just entered the house; and both of the men were slightly burnt, and sustained a shock to the system. Fortunately they happened to be standing at the side of the meter which was left intact; and the new governor standing on the other side of the meter was not touched. Messrs. Milne's man states that he was putting on the fittings ready for filling the meter with water when the explosion happened. The two gasholder valves and others were instantly closed, so as to put out the flame issuing from the broken connections; and gas making ceased for a few hours, until the pipes were re-connected. The gas supply to the town was not affected by the accident; and nothing else was damaged beyond a purifier cover, on to which the gable end of the building fell. Messrs. Milne's workman was the more seriously hurt; but it was expected that he would be able to return to Edinburgh last Saturday.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Stopped Ascension-Pipes.

Sir,—The article under the above heading in the "Journal" for the 12th inst. is a laboured attempt to reduce this well-worn subject to a mere matter of pockets and scrapers. In one sense, it is essentially such; for it seriously affects the *pockets* of shareholders, and often makes it difficult for much worried managers to *scrape* together enough profit to pay dividends. The writer of the article referred to has simply expanded his opening statement that "many of the stoppages which occur in ascension-pipes may be prevented by keeping the hydraulic main clear of tar." 'Tis a pity that a remark so pregnant with instruction should be spoiled by the statements following it.

Apparently the writer has never attempted to discover whether there was any necessity for a hydraulic main at all, or whether the trouble of stopped pipes had ever been experienced where it was absent. In his view, the hydraulic is the head and front of the mischief wherever it occurs, and a pocket and scraper the panacea for all the attendant evils. But he has only arrived at this conclusion after experimenting with various "schemes," which, however ineffectual in affording relief from the trouble in question, must each and all of them have proved very effectual in reducing the quantity and quality of the gas subjected to such treatment. With a hydraulic main partly filled with an accumulation of thick tar and other sediment, and in some cases the dip-pipes embedded in it, one cannot wonder that there were "a good many stopped pipes, and there was much leakage of gas round the mouthpieces," or that, under such circumstances, the yield of gas per ton of coal was low. It would be interesting to know whether the works possessed an exhauster, and what use was made of it. But having got thus far in his investigation, the writer of the article went astray, and has apparently never discovered how nearly he arrived at an important improvement in his methods of manufacture, which would, in the case he describes, have gone far towards curing the evil altogether.

With 6-inch ascension, arch, and dip pipes, a 6-inch clearance between the bottoms of the dip-pipes and the main would afford ample outlet for the gas, provided the tar and liquor were conveyed away as deposited; and the adoption of the so-called "dry main" at this juncture would have saved the writer a great deal of wasted time and energy. But if he—in common with the majority of managers—preferred to retain the hydraulic seal, the accumulation of thick deposit in the main might have been obviated by constant or intermittent flushing with liquor, and the adoption of proper means to draw off the tar. The adjustment of the dips and main so as to ensure uniformity of seal and a regular fall to the outlet, is a mere detail which would naturally suggest itself. The scheme advocated, of fixing pockets and scrapers, is troublesome, expensive, and unnecessary; and the statement that "one hydraulic main and a set of 6-inch ascension-pipes are sufficient to take away the gas from long retorts," is as lucid as the reply to the old question: "How many cows' tails would reach to the moon?" Unfortunately, stopped ascension-pipes are not confined to works where the hydraulic main is allowed to become choked with obstruction; and the remedy advocated by your correspondent only deals with one phase of the evil, and leaves the question as a whole untouched. Where such a flagrant condition of things as he has described exists, one would not be surprised at the prevalence of this and other troubles. Common sense and careful attention would soon remedy the evil. But there are plenty of works where there is no lack of these; and yet the old complaint continues to baffle the unfortunate manager. Mechanical appliances to *cure* the evil, are all very well in their way; but it is better to discover the cause, and *prevent* the effects by its removal.

One fruitful source of trouble in many works, is the time-honoured practice of erecting tapered ascension-pipes, smaller at the top than at the mouthpiece. The substitution of parallel pipes of sufficient diameter has been found effectual, where stoppages arose from this cause. Other causes of "stoppages" are irregular charging and irregular heats. Where direct firing is still in vogue, the utmost attention of the manager or foreman is required, in order to see that the fires are regularly maintained, as well as the retorts properly charged. The wayward stoker loves to exercise his discretion when the manager's back is turned—and often with very unsatisfactory results. By the adoption of generator or regenerative settings, the temperature may be maintained with much greater regularity; and then the problem of "stoppages" resolves itself into a question of weight. Every carbonizer aims at obtaining all he can safely get from his coal without reducing the quality of the gas below the required standard. But irregularity in this direction is certain to result unless the charges are weighed; because, though the stoker has a good idea how much coal should be put in, it is impossible—without weighing—to prevent variations often amounting to 28 lbs. or even 56 lbs., and this much more or less in a retort, may mean lowered heats, choked pipes, and wasted coal.

Excessively high heats and heavy charges are the most fruitful and the most vexatious of all the causes of stopped pipes. What is more grievous to a manager than to see the coke drawn from the retorts thoroughly "burnt off," and to find that the yield per ton has gone down abnormally low, in consequence of the waste resulting from opening lids and removing covers to clear stopped pipes? Given a setting in which the heat can, with ordinary care, be maintained with fair regularity, pipes and outlets of sufficient area, and a clear hydraulic or dry main (I, of course, presume an exhauster), let every charge be weighed in the barrow; and a few days' observation will suffice to enable the manager to determine the weight of charge and temperature of setting affording the best results—*viz.*, that weight (varying with size and form of retort and duration of charge) which can be thoroughly carbonized at such a temperature as will not cause deposit of pitch and carbon in the pipes and valves.

I have said nothing about the use of the augur; but the neglect of this is often an important factor in the causes of stopped pipes. Where it is regularly employed, and of sufficient diameter, the stopping of pipes

at the mouthpiece is very much reduced; but the most diligent use of the augur will not prevent stoppages occurring from the causes described above.

Willenhall, Jan. 14, 1897. JNO. C. BELTON.

The German Term for "Prepayment Meter."

In the article entitled "A String of Reflections" in the last number of the "JOURNAL," the word "*selbstverkäufendengasmesser*" was given as the German equivalent for "prepayment meter." A correspondent says the writer has not hit upon the customary German name, which is "*der Gasautomat.*" He acknowledges that it is bad; but it is more used than any other term. A better one than either of these, and one which is also employed, but less frequently, is "*Vorausbezahlungs-gasmesser.*" Our correspondent adds that the term employed by the author of the article in question, as well as many others, occurs in specifications filed by English firms.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

The Third Session of the Fourteenth Parliament of Her Majesty the Queen was opened last Tuesday by Commission; the ceremony taking place as usual in the House of Lords. The Queen's Speech announced that among the measures to be introduced in the present session would be Bills for making better provision for the compensation of work-people who suffer from accidents in the course of their employment, for improving the arrangements for water supply in the Metropolis, and, time permitting, for amending the existing procedure with respect to Private Bills coming from Scotland and Ireland.

On Friday, a large number of Bills were presented by private members, and read the first time. Among them were the following: Mines (Eight Hours) Bill, Boiler Inspection and Registration Bill, Plumbers' Registration Bill, Coal Mines Regulation Bill, Rating of Machinery Suspensory Bill, Rating of Machinery Bill, Borough Funds Bill, Employers' Liability for Injuries to Workmen Bill, London Water Companies Amalgamation Bill.

On the same evening, Mr. Lough put two questions to the President of the Board of Trade (Mr. Ritchie) on the subject of meters for the supply of electricity and gas. With regard to the former, Mr. Ritchie stated that the Board had approved the pattern and construction of two meters for use generally for the measurement of electrical quantity when supplied on the constant pressure continuous current system, and of one meter for use in certain Metropolitan districts with the alternating current. He said there was no statutory provision that such meters should be submitted periodically to a local authority for testing purposes. By the Provisional Orders granted under the Electric Lighting Acts, it devolved on local inspectors to certify electrical meters used otherwise than by agreement to be correct, and to be of some pattern and construction approved by the Board of Trade. This being so, there was no question of margin of error allowed by the Board of Trade. With respect to gas-meters, Mr. Lough's question was whether the approval of the Board of Trade for any particular meter was understood to cover its use through an indefinite time, or whether it was necessary for a gas company to submit their meters periodically to any local authority for re-inspection and approval. Mr. Ritchie informed the honourable member that, under the Sale of Gas Act, 1859, the duty of testing gas-meters was imposed, not on the Board of Trade, but upon inspectors appointed by the local authorities. The statute did not provide that meters should be re-tested at stated intervals; but it was open to gas companies or consumers to send their meters at any time to be again tested by an inspector.

The Home Secretary (Sir Matthew White Ridley) has given notice, in accordance with the announcement in the Queen's Speech, of a Bill for the compensation of workmen for accidents; and Mr. Hubbard (Brixton) has notified his intention of asking, on an early day, for the appointment of a Select Committee to "inquire into the present system of water supply for London, with the view of determining whether any existing defects in that system would be best dealt with by a policy of purchase or control."

PRIVATE BILLS (SESSION 1897).

Opposition on Standing Orders.

On Saturday, the 16th inst., the memorials complaining of non-compliance with Standing Orders in the case of the second hundred on the General List of Petitions for Private Bills for the present session were deposited in the Private Bill Office. Only one, however, related to a Bill in which our readers are interested—viz., the Malvern Urban District Gas Bill.

The petitions for the following Bills, which are comprised in the second hundred, will go forward: Chelsea Water-Works (Purchase) Bill, Chichester Corporation Water Bill, Clydebank and District Water Bill, Crowborough District Water Bill, Deal and Walmer Water Bill, Devonport Water Bill, Dublin Corporation Bill, Dundee City and Burgh Bill, East Warwickshire Water Bill, Edinburgh Corporation Bill, Harrogate Corporation (Water-Works Transfer) Bill, Harrogate Water Bill, Kent Water-Works (Purchase) Bill, Leeds Corporation Bill, London Water-Works (Purchase) Bill, Lowestoft Corporation (Water and Gas Works Transfer) Bill, Luton Water Bill, Newhaven and Seaford Water Bill, Newport Corporation Bill, Salford Corporation Bill, Stirling Burghs (Gas) Bill, Taunton Gas Bill, Tynemouth Corporation (Water) Bill, Tynemouth Gas Bill, Weymouth Consumers Gas Bill, and the Weymouth Water Bill.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Thursday, Jan. 21.

(*Before Mr. Justice* STIRLING.)

Incandescent Gas-Light Company, Limited, v. Sunlight Incandescent Gas-Lamp Company and Maddisons.

Mr. WALTER moved, on behalf of the Incandescent Gas-Light Company, Limited, for an injunction restraining the defendants, their servants, and agents from publishing by circulars, advertisements, or in any other manner, that any incandescent gas mantles constructed by the plaintiffs were infringements of any patents the property of the defendant Company. Also an injunction restraining the defendants from continuing to publish a circular, signed by the defendants Messrs. Maddisons, relating to an infringement by the plaintiffs of Rawson's patent, No. 11,161 of 1886, or any other circulars wrongfully and maliciously threatening customers of the plaintiffs with results alleged to follow from any action commenced by the defendant Company against the plaintiffs under the patent of Rawson; and for damages for malicious threats, and for slander of title. The circular complained of, which was signed by Messrs. Maddisons, Solicitors, was addressed "to all dealers in incandescent mantles;" and it was to the following effect: That Messrs. Maddisons acted as Solicitors for the Sunlight Incandescent Gas-Lamp Company, and had been instructed by them to inform the trade that the Company were the owners of the Rawson patent for stiffening and strengthening incandescent mantles, so as to make them transportable. The circular went on to say that the Sunlight Company had commenced an action against the Incandescent Gas-Light Company for infringement of the Rawson patent, and were advised that all the mantles sold by the last-named Company were infringements of that patent. It was also stated that the action would shortly be heard, and that Messrs. Maddisons were instructed to give notice to all purchasers of the Welsbach mantle that they exposed themselves to a like action for infringement for every mantle purchased or sold by them; and in the event of their clients succeeding in their action, such purchasers would render themselves liable to pay damages and costs, and in addition to have all their stocks of Welsbach mantles destroyed by order of the Court. The circular concluded by stating that the only persons entitled to deal in this country in mantles so stiffened and strengthened under the Rawson patent, in addition to the Sunlight Incandescent Gas-Lamp Company, were the New Incandescent (Sunlight Patent) Gas Lighting Company, to whom the former Company had granted the sole and exclusive licence.

Mr. BOUSFIELD, Q.C. (with him Mr. R. WALLACE, Q.C., and Mr. JENKINS), on behalf of the defendants, contended that not only were his clients entitled to warn infringers, but they were bound to do so. They were obliged to let the trade know that they were bringing this action against the Incandescent Gas-Light Company, and that they would be liable to similar actions. In order for the plaintiffs to succeed on the present motion, it was necessary to prove that the notices had been issued maliciously. Nothing had been shown which brought home to the defendants a charge of want of *bona fides* in the prosecution of their rights; and in default of that, the plaintiffs had no *locus standi* whatever on the present motion.

Mr. WARRINGTON, Q.C. (with him Mr. MACNAGHTEN), appeared for Messrs. Maddisons, and submitted that for the plaintiffs to succeed against his clients, they must prove personal malice, which had not been done. It was a great abuse of the practice of the Court to make the Solicitors parties; and he trusted that his Lordship would mark his sense of the impropriety of this proceeding by dismissing the motion with costs.

Justice STIRLING said he was quite clear that, as a matter of strict construction, the circular stated nothing which was not quite correct; but it was quite possible that people who were not lawyers might misread the passage which said: "In the event of our clients succeeding in their said action, purchasers will render themselves liable to pay damages," &c. To put it shortly, the plaintiffs must prove malice.

Mr. WALTER assented.

Justice STIRLING asked what was the evidence of malice in the present case.

Mr. WALTER replied that he took the fact of the issue of the circular itself, and the manner in which it was distributed broadcast.

Justice STIRLING: That is to say, if a patent is said to be largely infringed, and the patentee complaining of the infringement issues to a large number of people a warning against the infringement, that is said to be malice.

Mr. WALTER said the circular was signed by the Solicitors to the Company, and distributed round to the whole of the gas trade dealing in these incandescent mantles. He further contended that the defendants had been guilty of *laches* in commencing their action; as the patent they sued on was taken out in 1886, and the action was not commenced till 1895.

Justice STIRLING, in giving judgment, said the question he had to determine was whether he could look upon the circular as evidence of malice; but he was unable to do so. It was a circular that was no doubt drawn by a lawyer, who seemed to think that everybody was as familiar with the result of patent actions as he was himself; and it would be better if it were amended by stating plainly that damages could only be obtained against purchasers of the infringing mantles in some future action brought against themselves. It was said that the patent was an old one; and that no action had been brought on it till 1895. But the fact was that, though the patent was originally granted in 1886, it was not till September, 1895, that it was finally amended by striking out certain portions, and put in its present shape. As the action was commenced in the following November, the case of *laches* therefore broke down. The motion would be refused; the costs to be costs in the action. As regarded the Solicitors, they should not have been made respondents at all; and he thought he ought to say that the plaintiffs would be well advised in discontinuing the action against them at once.

Mr. BOUSFIELD suggested that the circular should in future run: "In the event of our clients succeeding in their said action, purchasers will render themselves liable in like actions brought against them," &c.

Friday, Jan. 22.

(*Before Mr. Justice* ROMER.)

Incandescent Gas-Light Company, Limited, v. Morning Sunlight Incandescent Gas-Light Company.

Mr. MOULTON, Q.C., moved on behalf of the plaintiffs for an injunction restraining the infringement of their patents. He produced evidence of the purchase of the infringing mantles and of their analysis.

There was no appearance on behalf of the defendants.

His LORDSHIP made the order as asked.

Similar orders were made against S. Lloyd and Co., the Apollo Incandescent Gas Company, Limited, Mundler, P. H. Reimer and Co., and the Star Incandescent Company; there being no appearance on behalf of the defendants.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Monday, Jan. 11.

(*Before Mr. Justice* MATHEW.)

Conservators of the River Thames v. Southwark and Vauxhall Water Company.

This was an action involving an important question to all the Water Companies drawing their supplies from the Thames—viz., whether they are entitled, by virtue of their statutory powers, to take water to any extent requisite for the service of their respective districts, or are restricted by the terms of agreements made by them with the Thames Conservators, in which they are limited to a certain maximum quantity.

Mr. JELF, Q.C., and Mr. BEMBER appeared for the plaintiffs; and Mr. CRIPPS, Q.C., and Mr. CLAUDE BAGGALLAY represented the defendants.

Mr. JELF, in opening the case, said it was an action for an injunction to restrain the defendant Company from taking a greater quantity of water than 24½ million gallons from the River Thames in any 24 hours; and it involved a question which had never been raised before—at any rate, not effectively—whether two agreements between the parties which had been acted upon for a long time, and which had been recognized, as he should submit, in Acts of Parliament, were in all respects valid. The statement of claim set out that up to 1852 the City of London had exercised, from time immemorial, the rights of conservancy over the Thames from Staines to Yantlet, in Kent; and that all the powers exercised by the City were, by an Act passed in 1857, transferred to the Conservators of the River Thames. The first agreement relied upon was made in 1852, between the defendants and the City, as Conservators of the river. It recited that a Bill was pending in Parliament for authorizing the defendants to take water from a certain point in the river, and that the City were apprehensive of injury to the navigation, but agreed to withdraw their opposition on the defendants entering into the covenants mentioned in the agreement. These were to the effect that they would pay to the City a yearly sum of £300, as a contribution towards the expense of keeping open the navigation, and that they would not take in any one day a larger quantity of water than 20 million gallons without the previous consent of the City. Up to that time, the defendants had powers to abstract water from the tidal way, but none to take it from the point above Teddington mentioned in the Bill. The Thames Conservancy Act of 1857 vested in the Conservators all the interest and powers of the City in the river, foreshores, &c., from Staines to Yantlet. In 1878, an Act was passed under which the defendants were required to pay to the Conservators £2000 annually, "in addition to any sums otherwise payable by the defendant Company to the plaintiffs;" thus recognizing the agreement of 1852. The second agreement relied upon was made in December, 1886. After reciting the previous agreement, and the statutory obligation to pay the £2000, and stating that the plaintiffs had represented to the Water Company that their annual income was inadequate for their purposes, and that they intended to apply to Parliament for a Bill requiring the defendants and all other Companies drawing water from the Thames to make further annual payments to the Conservators, it was mutually agreed that the defendants should pay a further annual sum of £1000, and that they should be at liberty to take and impound, during every 24 hours, any quantity of water not exceeding 24½ million gallons; thus giving them an additional 4½ million gallons. Then it was alleged that, in breach of this agreement, the defendants had taken a larger quantity of water than 24½ million gallons in 24 hours, and were still doing so; and an injunction was asked to restrain them. The defendants, as he understood, did not allege that these agreements were *ultra vires* altogether, but that, in a certain event, and if construed in a certain way, they were; though it seemed to him that an agreement must be either valid or invalid altogether. They said they had certain obligations imposed upon them by Parliament, and that if, in carrying out these obligations, they were obliged to exceed the limit of quantity stated in the agreement; then to this extent it was *ultra vires*. He submitted, in the first place, that it was too late to raise the question of *ultra vires* after it had been acted upon by both parties, and had been recognized in Acts of Parliament. Whether or not they should be allowed time to apply to Parliament for further powers, if they were in any difficulty, was a question for the discretion of the Court; but it was of vital importance to the Conservators to have a decision as to their legal rights under these agreements. There were in all six Water Companies who were interested in this question, who had certain rights *inter se;* and each had rights with reference to the Conservators, and obligations towards the public. It was therefore extremely important to have these rights determined.

Mr. CRIPPS said there were two Companies in exactly the same position as the Southwark and Vauxhall. The three Companies had statutory limits imposed upon them, which were the same as those mentioned in their respective agreements with the Conservators.

Mr. JELF then proceeded to refer to several Acts of Parliament, in which, as he contended, the agreements in question had been recognized. The first was the defendants' own Act of 1886, empowering them to construct additional works, raise further capital, and so on. Sub-section 6 of section 12 specified that nothing in the Act contained should alter, prejudice, or affect the agreement of July, 1852, between the Company and the Mayor, &c., of London, or the rights or powers of the Company or of the Conservators under that agreement, or be deemed to authorize the Company to take from the River Thames in any one day a larger quantity of water than the 20 million gallons to which they were restricted by such agreement without the consent in writing of the Conservators. These last words threw a light on the second agreement, which was a consent in writing by the Conservators to the defendants taking an additional 4½ million gallons of water. Then there was the Thames Conservancy Act of 1878, which rendered six Companies, including the defendants, liable to pay certain additional sums to the Conservators; "such payment to be irrespective of, and in addition to, any sums otherwise payable by the Companies, or either of them." So far as regarded the defendants, that could only refer to the sum payable under the first agreement. The 15th section gave power to anyone of the Companies who might not require the whole of the water they were authorized to take for their own district to supply the balance to either of the other Companies. By the original agreements, the Companies were only authorized to take water for their own particular use. The next Act was that of 1894—the Conservators' Act—and it provided, in section 296, that the various Companies should not abstract any greater quantity of water than they could lawfully take on or before April 5, 1894. Section 292 provided that the various Companies should pay to the Conservators the sums mentioned in a schedule, exclusive of any moneys payable under agreement. Another schedule gave a list of the agreements between the Companies and the Conservators; and in it appeared the two agreements now relied upon. This was a clear recognition of the agreement by Parliament; and even if it were before *ultra vires* or doubtful, he should submit that after that it was impossible to say now that the agreements were invalid for any purpose. The defendants contended that they could take any quantity of water they pleased—every drop; and as they were at the top, they could take it all before it reached the other Companies, and then sell it to them. It made absolutely valueless the protection afforded to the public and the other Companies by the second agreement. Their defence was that, under certain statutes, they were obliged to supply water—more water than they could take under the agreement. If there were anything in this contention, they must establish the fact by evidence. It would not do for them to dispose of some part of the water otherwise than under their statutory obligations, and then say they had not enough to fulfil these obligations. Such considerations might be a reason for granting time; but they could not alter the rights of the parties. Even if the 24½ million gallons were insufficient to enable the defendants to fulfil their statutory obligations, he should submit that this did not authorize the defendants to take water to which they were not entitled.

Mr. CRIPPS contended that, so far from Parliament having confirmed or sanctioned these agreements, it had carefully left the question of their validity open on every occasion, in order that the matter when raised might be decided by a Court. Private Bill Committees did not settle legal questions if they could possibly avoid it; and he thought this was clearly shown by the Act of 1894, to which reference had been made. He should ask leave to refer to the form in which the Bill was introduced.

Mr. JELF suggested that, if his friend were going to rely on the decision of a Court, he must conform to the rules of evidence.

Mr. CRIPPS submitted that he was entitled to refer to the surrounding circumstances when an Act of Parliament was passed, in the same way that he was justified in alluding to the surrounding circumstances when a private agreement was made. Substantially these Private Acts of Parliament were agreements between the parties. Still he thought the Act itself was clear enough; and he would not at present refer to the original Bill. The learned Counsel called attention to some of the passages in the Acts referred to, in order to bear out this contention.

Tuesday, Jan. 12.

On the resumption of the proceedings to-day,

Mr. CRIPPS continued his argument. He contended that the language of the Acts in question did not carry any recognition of the agreements, but simply authorized the payments made under them. He then proposed to refer to the Bill of 1894 as introduced.

Mr. BANKES objected that, when parties had come to an agreement in writing, they were not entitled to look at a previous draft, except possibly to explain ambiguous language.

Justice MATHEW believed this was so; but he suggested that it was hardly worth while raising the objection. He thought it would be better to let Mr. Cripps refer to it, subject to the objection.

Mr. CRIPPS pointed out that, in the Bill as introduced, the 289th section took the place of section 296 in the Act. The first sub-section provided that none of the six Companies should take in any 24 hours a greater quantity of water than that mentioned in the 5th schedule. If this provision had been carried out, no doubt the Company would have been limited to the quantity expressed in the second agreement, because that was what was named in the schedule. The proposal, therefore, was, when the Bill was introduced, that Parliament should restrict the quantity of water which the Company should take; but when the Act was passed, it simply said that in the future, and unless and until Parliament decided to the contrary, the Water Companies should be empowered to take the same quantity as they were lawfully empowered to draw on a given date—viz., the 5th of April, 1894. This seemed to show that the Conservators and the Company were left to their legal rights without any recognition of the terms of the agreement. Another Act referred to by Mr. Jelf was the Company's own Act of 1886, which provided, among other things, that nothing in the Act should alter, prejudice, or affect the agreement of July 1, 1852.

But he understood his friend to state that he did not rely upon this so much as on the Act of 1894, because he could not say that the former Act was anything in the nature of a recognition or confirmation of the agreement if outside that statutory confirmation. It would be *ultra vires*. Coming next to the agreement of 1886 between the Company and the Conservators, he said it was evident what the right meaning of it was. The Conservators were desirous not to restrict the quantity of water taken, but to get additional money for the purpose of carrying out their duties in connection with the Thames, while the Company were desirous of getting a further supply of water. The other Companies had been referred to; and he might point out that the case of some of them was much stronger than that of the Southwark and Vauxhall. For instance, the Chelsea Company had a statutory limitation of 20 million gallons; but the agreement in effect allowed that Company to take more. This seemed to be the clearest case possible of an *ultra vires* agreement between two parties—Parliament saying the limit should be 20 million gallons, and the Chelsea Company and the Conservators agreeing to extend it. The same thing applied in the case of the West Middlesex Company. They had an absolute statutory limitation; but the agreement, if not *ultra vires*, would enable them to take a further quantity of water. The proposition he sought to establish on behalf of the Water Companies was this—and it seemed to have been laid down by the House of Lords in the case of *The Aire Harbour Trustees v. Oswald*, and by Sir George Jessel in the case of *Mulliner v. The Midland Railway Company*—that when either a public body or a company had statutory powers, it was *ultra vires* for them to enter into any agreement which would restrict them in using those powers for the purposes for which they had been given by Parliament. The Act of 1852 was a Consolidation Act. In that year the Water Companies first had power granted to them to take water above Teddington, and for this purpose to construct works which were to be approved by the authorities for the City; and there was then no restriction as to quantity. There were certain statutory obligations with regard to the user of the water, and its supply for domestic purposes. Section 56, which was not used, gave the Company power to supply water for other than domestic purposes, at such rates as should be agreed upon; and he would point out that, after having entered into agreements, the Company were bound to supply the water. It was essential for the public convenience that such powers and obligations should be imposed. It would never do to leave people who wanted water for other than domestic purposes in such a position that the Company might cut the supply off at any time they pleased.

Justice MATHEW: You contend that the Company may say: "We have not enough water to supply domestic purposes, because we have imposed upon ourselves an obligation to furnish it for other than domestic purposes?"

Mr. CRIPPS said it certainly came to that.

Justice MATHEW said the learned Counsel must assume, for the purpose of the argument, an insufficient supply for both purposes. If a person entitled to a domestic supply said the Company were not supplying him in accordance with their statutory obligation, the Company might turn round and say the Act of Parliament had imposed upon them other obligations, with which they were complying.

Mr. CRIPPS said he would call attention later on to the provision which dealt with that difficulty. They could not take that as a defence.

Justice MATHEW remarked that he should think not; but the learned Counsel's construction would lead to the consequence.

Mr. CRIPPS said he would deal with this when he came to the penalty clauses. Under section 57, there was an obligation that the Company should, at the request of an owner or occupier within the district, supply by meter water which would not be used for domestic purposes, at certain charges which were fixed. On this point, evidence could be given, if necessary, as to the quantity so furnished. His case was simply this—that the Company had unlimited power, for the purposes of the Act, to take water; and that, for purposes which were in that sense obligatory, they were bound to take more than 24½ million gallons. Having referred to the Water-Works Clauses Act, 1847, which imposed penalties for neglecting to supply water on demand within the district, and to the Metropolis Water Act, 1852 (since superseded by the Act of 1871), which provided for a compulsory constant supply, which Counsel said was now carried out by the defendant Company to the extent of 95 per cent. of the total, he quoted at great length from the judgments of Lords Blackburn and Watson in the Harbour case already cited, in which it was laid down that a public body or company having parliamentary powers could not by agreement bind themselves not to use those powers. Lord Fitzgerald also, he said, delivered judgment to the same effect; and reference was made in those judgments to the Midland Railway case which was decided by Sir G. Jessel.

Mr. BAGGALLAY followed on the same side, and said the Company had no wish to depart from the agreement, so far as the payments to be made under it were concerned.

Justice MATHEW remarked that the agreement was either *ultra vires* or not. He could not give the Company credit for excellent intentions which were not binding on anybody in particular.

Mr. CRIPPS said, before his learned friend replied, there was one point he had forgotten. He did not know whether his Lordship would wish to have any evidence as to the quantity of water required. So far as domestic purposes were concerned, there could be no question. The only point was with regard to the supply for other than domestic purposes.

Mr. BANKES said it appeared to him that, according to one view of the case, there was a very serious dispute whether or not the defendants required the agreed quantity for the purposes for which they were supplying water. This might involve a somewhat long investigation into figures; and he was really not prepared at the moment to deal with that matter.

Justice MATHEW said he thought he had better try the broad question of principle first, and then he would hear anything further if necessary. The first question was whether or not these agreements were *ultra vires*, because they imposed a restriction on the statutory powers of the defendants.

Mr. BANKES, in reply, dealt first with the point that the agreements had been sanctioned or recognized by Acts of Parliament; and, secondly, with the legal question raised as to their being *ultra vires* by reason of their restricting the Company's parliamentary powers.

His LORDSHIP reserved judgment.

Monday, Jan. 18.

Justice MATHEW, in delivering judgment to-day, said this was an action brought by the Conservators of the Thames against the Southwark and Vauxhall Water Company, to obtain an injunction restraining the defendants from diverting from the Thames, within any 24 hours, a larger quantity of water than 24½ million gallons. The action was resisted on the ground that no such injunction ought, under the circumstances, to be granted. It appeared that, in the year 1852, the Lord Mayor and Corporation of London exercised the power of Conservators of the River Thames; and by an agreement entered into on July 1, 1852, it was stated that a Bill was pending in Parliament, and that the Mayor, commonalty, and citizens were apprehensive that, if passed, it would injure the navigation of the river, and therefore opposed the same. With the view of inducing the Mayor and Corporation to withdraw their opposition, it was agreed that the defendants should pay a clear yearly sum of £300, as a contribution towards the expenses of maintenance and keeping open the navigation of the river, and also undertake that they would not abstract from the stream in any one day a larger quantity of water than 20 million gallons without the previous consent of the Mayor and Corporation. The plaintiffs were incorporated under the Thames Conservancy Act of 1857, continued by the Thames Conservancy Act of 1894. By the Act of 1857, they took over all the estate and rights of the Mayor and Corporation in the river, and therefore became entitled to enforce the contract that had been entered into in 1852. Then by section 11 of the Thames Conservancy Act of 1878, it was provided that the defendants should pay, instead of the £300 annually specified by the first agreement, the sum of £2000, some time after the Act was passed. On Dec. 23, 1886, a further agreement was entered into by the plaintiffs and defendants, by which, after reciting that it had been proposed by the Conservators to bring in a Bill to increase the payments made to them, and for other purposes, it was provided, with a view to prevent the Bill being promoted, that the defendants should enter into a contract to increase their annual payment to £3000, instead of £2000; and it was further agreed that the defendants should not take in any 24 hours a larger quantity of water than 24½ million gallons. On these agreements, it was said that the plaintiffs clearly established their right to restrain the defendants from taking more than this quantity. It was not disputed by the defendants that they had taken a much larger quantity. But they tried to justify their doing so, notwithstanding these agreements, by a reference to the statutes they had from time to time obtained; and they insisted that the agreements which the plaintiffs endeavoured to enforce were *ultra vires*, and not binding. They sought to establish that in this way: They showed that, under their Acts of Parliament, they were required to supply water to certain districts, and for certain purposes; and they said that these purposes required a larger quantity of water than the 24½ million gallons. Therefore, they said that Parliament had imposed upon them the imperative obligation of finding a larger quantity than 24½ million gallons, and that the agreements which sought to restrict their rights were not binding, in accordance with the well-known principle that rights provided for public purposes on a Company like this could not be restricted or rescinded by any private agreement entered into between the Company and third parties. To this contention of the defendants, the plaintiffs offered a twofold answer. They said, in the first place, that the quantity provided for by the agreement would be amply sufficient, if evidence were gone into, for all the purposes which were imperative and obligatory upon the defendants; and that, if they chose to take more water, they exercised that option in their own favour, and were not required to do so under their Acts. There was a further answer that the agreements were not *ultra vires*, and that the restriction that they imposed was binding on the defendants, because it was said that, when the statutes came to be looked at, these contracts had been sanctioned by the Legislature in one Act after another, and that the basis of the whole of the legislation in regard to the defendants and the other Water Companies was the validity of the agreements entered into in this case, and in other cases of the same description. It was suggested, however, that it would not be necessary that evidence should be gone into as to the actual user of the water by the defendants; and it was agreed that such evidence should not be considered until the question of the agreements being *ultra vires* or not had been dealt with. It became necessary, therefore, to refer to the statutes, showing what was the argument upon one side and the other. The first statute relied upon by the plaintiffs was the Thames Conservancy Act of 1878. By the 11th section of this Act, six of the Metropolitan Water Companies were to pay to the Conservators an annual sum of £2000. This £2000 was the sum provided for by the agreement between the plaintiffs and the defendants; and it was said it was a recognition of the validity of the agreement. Then, by section 12, these payments by the six Companies were made a first charge upon their net receipts; and it was again said that this was a clear recognition by the Legislature of the obligation on the Companies to pay the sum referred to in the section. Section 15 was to this effect: Subject and without prejudice to all other terms and conditions contained in any subsequent agreement or Act of Parliament, it shall be lawful for any one of the six Companies to supply any part of the respective total quantity of water which they are empowered lawfully to take from the Thames, and not required for the purposes of their district, to any other or others of the six Companies, to be used only for the purposes for which the Companies are respectively empowered to provide and use the water. This again was said to be a clear recognition of the subsisting agreements, and to deal with the quantities provided by these agreements as those which alone the Companies were empowered to take. On these sections, without reference to any other, it was said that there was at the time a clear recognition of the agreement, and others of the same sort. The next Act referred to was the Southwark and Vauxhall Water Act, 1886. Section 12, subsection 6, of that Act provided: "Nothing in this Act contained or done under the authority thereof shall alter, prejudice, or affect the

agreement dated the 1st day of July, 1852"—that was the first agreement to which he had referred—"made between the Company of the one part and the Mayor, commonalty, and citizens of London of the other part, or the rights and powers of the Company and the Conservators under the agreement, or shall authorize the Company to subtract or take away from the River Thames in any one day a larger quantity than the 20 million gallons to which they are restricted by the consent of the Conservators in writing." It was therefore said that, in an Act of the defendants' own Company, there was the clearest enactment of the agreement that had been entered into, and an entire ratification of it; and this, it was said, might be treated as conclusive of the question. But there was a still further important statute to which the plaintiffs had referred—the Thames Conservancy Act of 1894. Section 292 of this Act provided that the Metropolitan Water Companies, including the defendant Company, should pay to the Conservators the annual sums mentioned in the second column of the sixth schedule to the Act, and to be exclusive of all payments under any agreements mentioned in the seventh schedule, or in any other Act not repealed by this Act, to be made to the Conservators by such Company. On turning to the sixth schedule, it appeared that the Southwark and Vauxhall Water Company were one of the Companies mentioned; and in the seventh schedule there were to be found the two agreements of July 1, 1852, and Dec. 3, 1886, specified as referred to in the previous section. There again, it was said, was the clearest possible recognition of the existence of the agreements, and of the obligation imposed on the Company and the other Water Companies to pay the sums specified in the schedule to which reference was made in the section. Then section 295 recognized equally clearly the agreement in question; and section 296 also. The latter section specified that no Company should, unless or until authorized to do so by Parliament, take a quantity of water from the Thames in any day greater than that which such Company might have lawfully taken on or before the 5th of April, 1894. Thus there was a recognition of what they were entitled to do on the day in question, and a provision that they should not be entitled to do more. Section 297 provided that the Metropolitan Water Companies should, at their own cost respectively, within one year after the passing of the Act, provide and maintain in good working order suitable appliances for measuring or ascertaining the quantity of water taken by them from the Thames. There, it was said, was a provision enabling the Conservators to ascertain that the Companies did not abstract more than the bulk of water they were entitled to take under their agreements; and that it was perfectly clear that the basis of these provisions with reference to the defendant Company was the existence and validity of the agreement restricting the quantity they were to take. It was further said that Parliament had clearly recognized the agreements; that they were not *ultra vires;* and that the plaintiffs were entitled to enforce them. What was the answer to all this? Defendants' reply began with a criticism on section 296; and from this section the argument was ingeniously carried back to the prior statutes. It was said that the true construction of this section was not that it recognized the agreement as valid, but indicated that the Legislature intended that its validity should be left to be afterwards determined in a Court of Law. In other words, that there was to be added to this section 296 a proviso in a final clause something to the effect that, without any agreement, the quantity to be taken on the 5th of April, 1894, should be lawfully taken—a proviso, therefore, that the validity of any agreement which had been entered into should be left undetermined. But this section dealt with six Companies. As to three of them, the limitation of the quantity to be taken was statutory; and as to the other three, if he recollected rightly, there were agreements like the one in question. It certainly seemed to be an extraordinary mode of legislation under the section, that any distinction should be drawn in favour of those Companies who had an agreement and where there was no statutory limitation. In support of the argument, reference was made to the Bill as originally introduced; and he was asked to look at the Bill as throwing light on the matter by reason of the difference in the terms of the section in question. He was clearly of opinion that the Bill was inadmissible for the purpose; but the evidence, if it could be so described, was given subject to objection. Having heard the terms of the Bill and the comments upon it, it seemed to him that it threw no light whatever on the true construction of the section. What those who framed the section had in their minds, was a matter on which they need not speculate; but on the question whether there was any indication that the Legislature meant to introduce such a proviso as was put forward on the part of the defendants, he was clearly of opinion that the true construction of the section did not admit of any such suggestion. That this was so seemed to be established by the succeeding section (297), by which this Company and the others were to maintain in good working order suitable appliances, to be approved by the Conservators, for ascertaining the quantity of water taken. It would be extraordinary indeed that this obligation should be put on the defendants if the Legislature entertained a doubt as to whether they were under any obligation at all to restrict the quantity. Why should they have to pay for the measuring of water which they might lawfully take in any quantity and without any limit? The only answer offered with respect to this was that the section was not introduced for the purpose of indicating the meaning of section 296, but generally in the interest of the public, in order that the Conservators might ascertain what was being done. This construction did not account for the obligation imposed on the Companies to provide the necessary appliances; and he was unable to account for it, except on the ground that section 296 bore the meaning attributed to it by the plaintiffs, and was not open to the qualification suggested by the defendants. With reference to section 292, it clearly indicated that the agreements were intended to be treated as valid and subsisting. The only comment suggested by the learned Counsel for the defendants was that it would not have been necessary to refer to this agreement in the schedule if it were already binding. But really this was an argument that the more clearly the meaning of the Legislature was expressed, the more certain it was that the meaning should not be adopted. This was really all it came to. One could quite understand that it was inserted to make the matter clear beyond all doubt. The section remained exactly as it was for the purpose of pointing out the binding character of the agreement in question, and the other similar agreements which had been entered into. Going back from this original criticism to the earlier statute, all that was said about it was that it neither added to nor took away anything from the agreement, but left it an open question, to be settled afterwards, whether or not it was binding. He was clearly of opinion that the plaintiffs had established their right to an injunction; that the agreement was binding on the defendants; and that they were not entitled to the larger quantity of water they had taken. He must therefore give judgment for the plaintiffs, and grant them an injunction in the terms asked; and the defendants must pay the costs.

Mr. CRIPPS said he understood Mr. Jelf, in his opening, to say there would be no objection to some suspension of the injunction. It was very possible that his clients might take his Lordship's decision as final; but they would wish to consider the matter.

Mr. JELF said, if the decision were accepted as final, his clients were desirous of giving every indulgence—as, for instance, waiting until this time next year. It was too late now to give notice for a Bill in the present session. But the injunction might be suspended for a year; and, if necessary, and if his Lordship thought well, the time might be still further extended. But this was only on condition that the decision was final.

Justice MATHEW said the parties ought to be able to decide within a week. The better arrangement would be, if they elected to appeal, to come before him, and see how the matter could be put into a technical shape; or if they agreed between themselves, there would be no need to come at all.

(*Before Justices* WRIGHT *and* BRUCE.)

Regina v. Justices of London (Ex parte East London Water Company).

This was a rule *nisi* for a *mandamus* to the Justices sitting in Quarter Sessions to hear an appeal by the East London Water-Works Company against the valuation of the Assessment Committee of St. John's, Hackney.*

Mr. BALFOUR BROWNE, Q.C., and Mr. RYDE appeared to show cause against the rule; Mr. CRIPPS, Q.C., Mr. MICKLOW, and Mr. P. J. BARNES supported it.

The case arose under the following circumstances: The Company served the proper notice of objection to the valuation before the Assessment Committee. In it they objected only to the rateable value assigned to their property in the list, and did not object to the gross value. The Assessment Committee disallowed the objection; and the Company thereupon appealed to the Quarter Sessions. In their notice of appeal, they sought to impeach the gross as well as the rateable value. When the case came on, the Overseers raised the point that the appellants, not having questioned the correctness of the gross value before the Assessment Committee, could not do so on appeal. The Justices adopted this view, and intimated that they would hear the appeal as to the rateable value, but not as to the gross, which must be taken to be £20,000, as it stood in the list. If the appellants could show that, by proper deductions, the rateable value ought to be reduced below £15,223, they could do so. The appellants then asked for an adjournment to consider their position; and this was granted. They then came to this Court and obtained the rule.

Mr. RYDE first submitted that there had been no refusal to hear and determine; and that a *mandamus* was not the proper remedy. He said the appellants ought to have taken the decision of the Justices, and then asked for a case. The learned Counsel stated the facts, and cited the sections of the Valuation of the Metropolis Act, 1869, which bear on the point.

Mr. CRIPPS submitted that, in effect, the Assessment Committee had waived the question of objection to the gross value, and that it was entertained; and he argued that the whole matter was therefore open to the appellants before Quarter Sessions. In reply to the Bench, he could not say that the Overseers consented to the objection being waived; but he was present, and did not dissent.

Justice WRIGHT asked for any evidence that the Committee did consider and decide the question of gross value.

Mr. CRIPPS read a portion of the affidavit of the appellants' Surveyor, Mr. Marshall, which he thought showed that the gross value put forward by that witness—viz., £16,673 odd—was considered by the Committee.

Mr. BALFOUR BROWNE said his view of the evidence was that the Committee did not go into the question of gross value.

Mr. CRIPPS thereupon read further passages from affidavits on which the rule was obtained. He submitted, first of all, that the question of gross value was entertained by the Committee; secondly, that the consideration of the rateable value included a consideration of the gross value, and that therefore the Quarter Sessions ought to have gone into it.

Justice WRIGHT said he was of opinion that the rule must be discharged. The question arose primarily on the 32nd section of the Act of 1869, which provided that any person aggrieved by any decision of an Assessment Committee on an objection made before them to which he was a party, might appeal against such decision to the Assessment Sessions. In this case, there had been an appeal to the Sessions by the Water Company, purporting to be against a decision of the Assessment Committee on both the gross and the rateable value of the hereditaments in question; and the Court had to decide whether, in point of law, there had been a decision of the Committee on the question of gross value. After stating the facts, his Lordship said it was provided by section 19 of the Act of 1862, which was incorporated in the Act of 1869, that the Committee should not hear any objection to the valuation list unless notice thereof had been given to them and to the Overseers, except in the event of the Overseers consenting to the hearing of the objection. The Act of 1869 further provided that the notice of the objection should specify the correction which the objector desired to be made. This was enough to dispose of the case, unless the Committee had power to waive, and did waive, the insufficiency of the notice. In the present instance, the notice did not contain any reference to the gross value, and did not specify any correction thereof which it was desired to make. He did

* See "JOURNAL," Vol. LXVIII., p. 744.

not think the evidence made out that the Committee came to anything like a decision on the point of gross value; nor could they do so unless the objection were specified in writing.

Justice BRUCE concurred.

The rule was therefore discharged, with costs.

COUNTY OF LONDON ASSESSMENT SESSIONS.

Sessions House, Clerkenwell, E.C.—Monday, Jan. 18.

(Before Mr. LOVELAND-LOVELAND *and a Bench of Magistrates.)*

Southwark and Vauxhall Water Company v. The Guardians of Lewisham Union.

This was an appeal from the valuation lists prepared in connection with the last quinquennial assessment of the Metropolis.

Mr. CASTLE, Q.C., and Mr. GORE BROWN appeared for the appellants; Mr. BALFOUR BROWNE, Q.C., and Mr. TYRRELL PAYNE represented the respondents.

Mr. CASTLE, in opening, said the Court would not be troubled with figures, but simply as to whether three items—certain mains in the parish of Lewisham, a reservoir known as Forest Hill reservoir, and a caretaker's cottage adjacent—should be assessed in three sums instead of one. It had been agreed that, if they were to be separately assessed, the figures should be: £300 gross and £250 rateable for the reservoir; £16 gross and £13 net for the caretaker's cottage; and £25 gross and £20 net for the mains—a total of £341 gross and £283 net. At present, the assessment stood at £360 gross and £300 net, so that there would be a reduction in any event. He also wished the three items to be sub-divided; and then that the occupier's name should be struck out as regarded the reservoir. In 1884, the Company sought certain parliamentary powers, among which was authority to make this reservoir. Their Bill was thrown out, on account of the nearness of some dust-heaps to the site; but eventually, in 1887, the reservoir was completed—so far as digging it out and building up the sides was concerned. The fact of the filtering-bed being so near to these dust-heaps, and other considerations, led the Company to remove the filter-beds to Hampton; and then it was resolved to enter on an extensive scheme, under which they created a large reservoir at Nunhead, and placed very powerful pumps at Wandsworth to fill it, and at the same time to supply London by pressure of the pumps direct into the mains. The height of the Nunhead reservoir was 150 feet; and that of the Forest Hill reservoir, 340 feet. The Engineer who would be called would state that the Wandsworth pumps were simply incapable of putting a drop of water into the Forest Hill reservoir, which, save for testing, had never been filled. It had never been used, and at present could not be used. The property was not rated till 1890, when the Overseers put it at £834; but on the facts he had just narrated being laid before the Assessment Committee, this assessment was reduced to £12, which represented the value of the land before the commencement of the works, and which Counsel held ought to be the value placed on it now. In the year 1894, the parliamentary district of the Company was extended to a part of Lewisham; and as a consequence, the Company supplied the district with a small quantity of mains, the value of which was now agreed at £25 gross and £20 net. Save as regards these mains, the facts between 1890 and 1895 had not altered. Yet the Assessment Committee had lumped the three items together, called them one hereditament, and asserted that the Company were in occupation of it by reason of a caretaker who lived in the cottage, and that therefore they must pay rates for the whole. On the other hand, the Company contended that the three items were capable of separate occupation, were constructed under separate powers, and were capable of physical subdivision.

The CHAIRMAN: I can quite understand that the mains, being supplied by the Nunhead engine, would have nothing to do with the reservoir; but the caretaker's cottage would, would it not?

Mr. CASTLE: That is a question I should like to have to argue when there was a summons for the rates. It is rather an Overseer's question. It has been frequently held that a caretaker is not in occupation of premises.

Mr. D. F. *Worger*, Assoc.M.Inst.C.E., examined by Mr. GORE BROWN, said that he was Assistant Engineer to the Southwark and Vauxhall Water Company. In and before the year 1885, the filter-beds were at Battersea. About 1885, the Company desired an Act of Parliament giving them power to construct a reservoir to serve Wimbledon. A Private Bill was introduced in that year, and thrown out. The Act was, however, obtained in 1886; and the reservoir was constructed then, or in 1887. The Company were very anxious to meet the views of the Local Government Board, by doing away entirely with the filtering at Battersea; and as a preliminary, they had to make arrangements for taking up the high-pressure London work from a different station. The idea was to remove the filter-beds to Hampton, and take up the high-pressure work from a new pumping-station at Wandsworth. In doing this, the Company found it would be more convenient to supply Wimbledon direct from the new station at Wandsworth than from the Forest Hill works; so that after the Forest Hill reservoir was finished, the necessity for it, as regarded its immediate use, had gone. As a matter of fact, it had never been used. Wimbledon was now supplied from the pumping-station at Wandsworth; and the small district of the Company in Lewisham, from the higher reservoirs at Nunhead. There were reservoirs at two levels—namely, 158 feet and 200 feet—at Nunhead. The Forest Hill reservoir was 340 feet high. The engines at Wandsworth could not possibly pump water into the Forest Hill reservoir, owing to insufficient power. It was intended to fill this reservoir by means of other engines, which, however, had never been erected. There was no connection between the Forest Hill and Nunhead reservoirs, or between the mains and the reservoir at Forest Hill. The reservoir was of concrete; and adjacent to it was a cottage for the caretaker, who had only to look after the land. The cottage was capable of separate occupation.

Cross-examined: The whole property at Forest Hill was about 1¼ acres in extent; and the only approach to the cottage was a road from the Honor Oak Road. He could not tell the cost of the land or of the work on it; but the latter might be about £5473. At present, the reservoir was absolutely worth nothing to the Company; and it would remain so till it was in use, which was not likely to occur for some time, as the purpose for which it was constructed had been otherwise effected. Only the Wimbledon district, and a few of the higher portions of Roehampton and Clapham Common, had to be supplied from Nunhead by pumping direct from the Wandsworth works. In order to serve the Wimbledon district from the Forest Hill reservoir by gravitation, they would first have to pump the water into the reservoir. The Company were pumping from 30 to 31 million gallons daily from the Thames; but they only had power to take about 24⅓ million gallons. A judgment was that day, he believed, being delivered in the High Court on the subject. If this judgment limited them to taking the lesser quantity, they would not immediately have to use the Forest Hill reservoir as a store, because the district required 30 million gallons a day, and they would consequently never be supplying less than the 24 million gallons. He admitted that the reservoir was very well situated as to height; but as to it being of great value to two rival Companies—the Lambeth and the Kent—he said that they were a long way away, and would have to incur great expense to utilize the reservoir. A main ran from the reservoir to the valve-house at Nunhead, from whence the water was distributed; but this connection of the main into the house could not be effected or utilized without discarding present works and making various alterations. The work of connecting would take perhaps a couple of months. It would require enormous plant to enable the reservoir to be filled in a day. The reservoir had been tested by filling it with water; and to do this, they had had to work a donkey engine for over a month. Taylor, the caretaker, had to look after the reservoir—see that the drains were clear, cut the grass, light a lamp at night, &c. He believed the reservoir was in good condition.

Re-examined by Mr. CASTLE: The caretaker's duties were the same now as in 1890, when the Assessment Committee reduced the assessment. The Lambeth Water Company already supplied witness's cistern, which adjoined, and was 25 feet higher than the level of the reservoir; so that that Company would not require the reservoir.

This concluded the case for the appellants; and Mr. Balfour Browne intimating that he should call no evidence,

Mr. CASTLE briefly addressed the Court. He quoted the case of the London and North-Western Railway and Buckmaster, from which he contended that the Company were justified in the course they had taken. The point to be decided was: Was this reservoir capable of being considered, apart from the caretaker's cottage, as being occupied by the Company; and if so, was it in the occupation of the Company? He did not think they need argue the point, because occupation did not mean possession. In conclusion, he suggested that they came under that provision of the law under which the owners should make good any deficiency in the rates occasioned by the site being non-productive during construction of works.

Mr. BALFOUR BROWNE, in a short reply, said that though at this moment the reservoir was not in work, yet he could not doubt that it was of use to the Company. That, he contended, was the test. Suppose a man was annoyed by the thinness of the walls of his house, and he took two houses, one on each side of his own, in order to have privacy and quiet. No one in his senses, although the man put his furniture in one house only, could deny that he was occupying the three. And the same applied to the Company. Moreover, the Company were entitled to an insurance in the way of works; and just as a standby engine must be rated, so also must a standby reservoir. The witness said the reservoir was well made and in perfect condition. It was kept for some purpose, which he (the learned Counsel) asserted was the purpose of insurance; and consequently it must be rated. Regarding the rating of the items separately, he contended that the reservoir was maintained for the express purpose of being used, though it was not in actual work; and, further, that it was not severable from the occupation of the caretaker. He cited several cases in support of his view; and, in conclusion, submitted that, upon the authorities and arguments he had adduced, the splitting up of the valuation was not necessary, and the Company were not entitled to it.

The CHAIRMAN, after a short adjournment, delivered judgment. He said the Court had had no evidence of the absolute value of either the whole undertaking or the three parts; and therefore they were bound by the agreed figures as being proper figures to be placed in the list to represent the property. The only question was whether they should alter its description, and give it three separate ratings. After having taken careful note of the evidence, the Court was not disposed to alter the rating, but to rate the whole undertaking at one figure; and as there had been a sort of understanding that £341 gross and £283 net were the figures that they should place upon the whole of the property, the Court would accept these figures. That applied to the whole undertaking—mains, reservoir, and cottage.

Mr. CASTLE asked the Court to grant a case for appeal, as he considered the points raised of importance; and this was agreed to.

Wilson and Son v. Arden Hill and Co.

In this case, which came before Mr. Justice Romer, in the Chancery Division, last Friday, Messrs. Charles Wilson and Son, the well-known gas-stove makers at Leeds, sought to restrain the defendants, who carry on business at Birmingham, from infringing a patent for gas-stove burners. The defendants admitted that there was a serious question to be tried, and offered to keep an account until the trial when the matter could be disposed of once for all. The plaintiffs were willing that this course should be adopted; and his Lordship simply directed the motion to stand till the trial.

The Incandescent Gas-Light Patents in France.

The Appeal Court in Paris has lately given judgment in an appeal by certain manufacturers of mantles for incandescent gas lighting from a decision of the Tribunal Correctionnel of the Seine, by which they were held to be infringers of the Welsbach patent, and condemned to pay fines. The decision of the Tribunal was noticed in the "JOURNAL" for

June 30 last (p. 1482). The appellants did not deny the infringement; but they contended that the patent in question was bad. They argued that Dr. Auer's invention was not patentable, because it did not produce a new industrial result—in other words, there was want of novelty; that the patent had not been brought into use within the two years specified by the law of July 5, 1844; that it had been anticipated; that it had been insufficiently described in the application; and that it should be declared invalid because the owners (the French Incandescent Gas-Light Company) had introduced into France mantles made in Austria—a country not included in the international convention for the protection of industrial property. The last point was the one upon which the appellants concentrated their forces. The Court, in a judgment which occupied three-quarters of an hour in delivery, carefully considered all these contentions, and successfully disposed of them. The fines imposed by the Court below were considerably increased; the order made by that Court for the insertion of copies of the judgment in certain newspapers was upheld; and the respondent Company were granted damages.

Breach of Contract to Supply Cement.

In the High Court of Justice, Ireland, Justices Johnson, Holmes, and Madden have had before them an appeal in the case of *M'Crea and M'Farland v. Knight, Bevan, and Sturge*. The action, which was originally tried before Mr. Justice Gibson and a special jury, was brought by plaintiffs, who are contractors in Belfast, against defendants, who are cement merchants of London, to recover damages laid at £1000 for breach of contract to supply them with 8000 tons of cement required in carrying out a water-works contract for Manchester. Mr. Justice Gibson had directed a verdict for the plaintiffs for £375. Defendants now sought to have this set aside, and judgment entered for them, or in the alternative that a new trial should be ordered. The Court, however, affirmed the verdict.

The Charge of Embezzlement against a Collector.

In the "JOURNAL" for the 29th ult., we announced the committal for trial of Henry John Prosser, on the charge of embezzling moneys belonging to The Gaslight and Coke Company, in whose service he was as a collector. On the matter coming before the Grand Jury at the Central Criminal Court, they discharged the bill, and the accused was liberated.

The Hull Corporation and the Kingston-upon-Hull Gas Works.—A town's meeting was held at Hull last Wednesday to consider the Bill the Corporation are promoting in Parliament for several objects, one of which is to acquire power to purchase the property of the Kingston-upon-Hull Gas Company. In the course of the discussion, some exception was taken to the price it is proposed to pay for the undertaking; and one or two speakers asserted that the matter had been "rushed." Alderman Massey denied that there had been any disposition to "rush" the question; negotiations having been commenced some twelve or thirteen years ago. Regarding the price, Alderman Massey made out a favourable case. He said the net income during the last financial year was £4805; and on the principle that concerns were valued upon what they could earn, he contended that £92,000 was a reasonable figure. A resolution consenting to the promotion of the Bill was carried with little opposition. A poll was thereupon demanded by a Mr. Austen; but he subsequently had an interview with the Town Clerk (Mr. R. Hill Dawe), Mr. Laverack (the Chairman of the Parliamentary Committee), and Alderman Massey, and withdrew the demand on receiving from the Town Clerk an undertaking to amend, subject to the sanction of Parliament, section 106 of the Bill, so as to provide that the purchase of the undertaking shall only be made by permission of the Local Government Board.

Engineers' and Solicitor's Costs in the Driffield Gas-Works Transfer.—The Driffield District Council are much exercised over the fee of one of the Engineers and the costs of the Solicitor engaged in the recent proceedings connected with the transfer of the gas-works; and their bills have been subjected to much criticism at two or three meetings. The Engineers concerned in the matter on behalf of the Council were Mr. Charles Sellers, of York, and Mr. Martin Samuelson, of Hull. No fault was found with the fee of Mr. Sellers, who was appointed by direction of the Council; but the charges of Mr. Samuelson were described by one of the members (Mr. Brown) at a meeting of the Council, as "high, and double those of their own Engineer," and yet, he understood, Mr. Samuelson "only assisted Mr. Sellers." These remarks annoyed Mr. Samuelson; and he wrote the Clerk of the Council a letter in which he characterized Mr. Brown's remarks as ungenerous and exceedingly uncalled for. He suggested that it would be well if the Council made inquiries as to the cost of similar proceedings to those in which Mr. Stephenson (the Solicitor) and himself had been engaged—*i.e.*, in obtaining a Provisional Order and purchasing works; and it would be found that the total cost of under £1100 was exceptionally reasonable. This letter was read at a meeting of the Council a few days since, on which occasion a report of a Committee was also read with reference to the Solicitor's bill of costs, amounting to £830 13s. 9d. In moving the adoption of the report, Mr. White said the Committee had previously obtained a rough estimate of the costs and expenses of obtaining the Provisional Order. They had now procured more definite and detailed particulars, which only amounted to about one-half of the rough estimate. The charges as they now stood required their very careful consideration; and that they intended to devote to them. Information was asked for as to the items, which the Committee thought should not be charged to the Council; and Mr. White replied that there were many, but the principal one—and this was only an objection of his own—was the charge of £250 by Mr. Samuelson. Mr. Brown said his remarks at the previous Council meeting appeared to have been not very palatable in a certain quarter. He had failed to learn why Mr. Samuelson was employed, and by whom. These remarks led to further observations of a similar character, in the course of which it transpired that Mr. Samuelson was engaged by Mr. Stephenson, and not by the Council. The motion was carried; but it is evident the Council do not intend the matter to rest here.

MISCELLANEOUS NEWS.

EXTENSIONS AT THE LEEDS GAS-WORKS.

Local Government Board Inquiry.

The Corporation of Leeds having applied to the Local Government Board for sanction to the borrowing of £100,000 for gas-works purposes—including a new retort-house, stoking machinery, coal-stores, tar-tank, and extensions of mains—Colonel J. O. HASTED, R.E., held an inquiry in regard to the matter at the Town Hall last Friday.

The TOWN CLERK (Mr. J. Harrison) represented the Corporation; and among those in attendance in support of the application were the Chairman of the Gas Committee (Mr. Lowden) and the General Superintendent of the Gas-Works (Mr. R. H. Townsley).

The TOWN CLERK explained that the application was based on a resolution passed by the City Council on the 7th of October last; and it was forwarded to the Local Government Board, accompanied by an estimate showing the proposed work. The Corporation had never before, in their whole history, had an inquiry on gas expenditure or loans. They purchased the gas-works in the year 1870—one portion from the Leeds Gaslight Company, and another from the Leeds New Gaslight Company. Taking over the powers of these two Companies, they became vested with authority to supply gas, not only in the town of Leeds, but also to the neighbouring township of Roundhay. The original cost of the two undertakings was £679,388. The maximum price which might be charged for gas by the two Companies was 5s. per 1000 cubic feet; but when the works came into the possession of the Corporation, 3s. 9d. was deemed to be sufficient. By the Act of 1870, the Corporation were empowered to borrow £950,000 for the purchase and development of the property. At that period, it was not deemed necessary to fix any term for repayment; and so they continued the loan in perpetuity. In 1877, the town had very largely developed; and application was made to Parliament for a further loan, required by the extension of the area of supply to the townships of Adel, Rothwell, and Shadwell. Thereupon a further loan of £300,000 was authorized; making a total of £1,250,000. This was the whole borrowing power of the Corporation in regard to their gas undertaking; and it had been just about exhausted. In regard to the £300,000, the Act giving power to raise this sum made it obligatory on the Corporation to set apart a sinking fund of 1 per cent. interest on moneys borrowed. This was for a term of fifty years; and 1 per cent., with compound interest, would repay the whole amount in that time. Coming more particularly to the present application, he explained that there were three works—Meadow Lane, New Wortley, and York Street. The total number of retorts was 2400; and the maximum make of gas, when all of them were in use, was 13,750,000 cubic feet per 24 hours. During the winter months, the average quantity of gas actually sold was considerably larger than the production—13,786,000 cubic feet—of course, excepting Sundays. This showed that it was actually necessary for them to work practically every Sunday, and to do all they possibly could in the way of storage. Notwithstanding this very great demand, and the fact that it was even more than the daily supply, it must of necessity occur that repairs were needed; and this made more clear the difficulties of the situation and the urgency of the case. They had, in point of fact, sometimes been so short of gas that the maximum pressure had rarely been maintained; and hence complaints had been made, particularly on dark or foggy days. In these circumstances, the plant had been taxed to the very utmost. He would give just one illustration. One day lately, so near Christmas time as to make the case very well remembered, they sent out no less than 16½ million cubic feet of gas, as against a total make of 13¾ millions. This would show how hardly they had been pressed. During the last five years, there had been an average annual increase of more than 2 per cent. in the quantity of gas sold.

The INSPECTOR: What is your storage?

Mr. TOWNSLEY: Fifteen millions.

The TOWN CLERK: We have practically storage for just one day's consumption.

The INSPECTOR asked what was the present price.

The TOWN CLERK said it was 2s. 2d. per 1000 cubic feet within the city, and 3s. to the outlying townships. He added that the supply outside was not very large, and the revenue was only about £1000, he thought, from the whole. Reverting to the subject-matter of the application, the estimate might, he said, roughly be divided into five parts—the retort-house, stoking machinery, coal-stores, tank, and extensions of mains and services. For the retort-house, the installation of inclined retorts, and the accessory plant at Meadow Lane, the estimate was £45,896; for the new stoking machinery, which was at New Wortley, £16,476; for the coal-stores, which were both at Meadow Lane and New Wortley, £6818; for the tar-tank at New Wortley, £2300; and for the extension of mains and services, calculated for a period of five years, £28,510. These items together made £100,000. The first item was close upon one-half of the expenditure for which sanction was sought. For this sum, 392 additional retorts were to be erected at Meadow Lane, which would increase the production of gas by 2¼ million cubic feet, or 16 per cent. of the total make. He had mentioned that the average annual increase in the sale of gas was 2 per cent.; and the provision they were making by these extra retorts would, it was calculated, be sufficient to meet their requirements for the forthcoming eight years. The next item was for stoking machinery, which was needed to bring their stoking plant up to date. It was partly on the compressed air, and partly on the hydraulic system. Being merely a substitution of one system for another, it would not greatly increase the production; but there would be a very material saving of labour, which was one of the main advantages of the new system. The third item was for coal-stores, which were calculated to hold 24,000 tons. The maximum quantity that could be stored now was 31,000 tons; and of this quantity only 9000 tons were at present under cover. This was a very great disadvantage; and the Committee had hitherto suffered considerable loss by the deterioration of coal through exposure to the weather. This loss, by the fresh provision they were making, they hoped to prevent in the future; and they ventured to

believe that the expenditure of £6818 on this account would be a very remunerative investment. With regard to the underground tar-tank, which was to be at New Wortley, he might say that at the present time there was only storage for 1000 tons of tar and ammoniacal liquor, which was only equal to one week's make when all the retorts were in use; and the New Wortley works were their largest. There they were making 7 million cubic feet of gas daily; and they had found that the capacity for the storage of tar and liquor was absolutely inadequate. When there had been any breakdown at the chemical works, and the contractors had not been able to take the tar so quickly as they should have done, they had been compelled to run it down the drains or stop the works. The new tank would increase the storage to the extent of another ten days—a matter of great importance in regard to the management of the undertaking. The only other item that needed explanation was the one with reference to the extension of mains and services—£28,510 for five years. The City Accountant had made a calculation to the effect that the average annual expenditure on extensions the last five years had been £6040 6s. 9d.; so that the Inspector would see that they were under the average in the amount which had been suggested. In these circumstances, perhaps he might be permitted to ask him to recommend to the Board that the term of five years be allowed, rather than a shorter one.

The INSPECTOR remarked that he thought it was not usual to allow five years.

The TOWN CLERK: May we ask the Board to consider whether this is not a case where they might, notwithstanding their rule, extend it?

The INSPECTOR said he did not know whether or not there had been any case of allowing five years. But he thought, if the Board did so, they would ask for plans showing where the mains had been laid each year.

The TOWN CLERK replied that the Corporation would be pleased to furnish them. He added that the city was developing by leaps and bounds. According to the census of 1871—just after the gas-works had been acquired—the population was 259,212; now it was over 400,000. The Corporation were undertaking many improvements, and were developing the suburban parts of the city, which had the largest area of any town or city in the United Kingdom. It was therefore more than probable that they would have considerable extensions of mains; and if it was the pleasure of the Board not to allow a term of less than five years, a great deal of trouble would be saved, and no disadvantage would accrue.

The INSPECTOR observed that he would require details for all the items, as various terms of repayment were given for different parts of a scheme.

The TOWN CLERK wished to mention that this was the first time the Corporation had applied to the Local Government Board for money on account of their gas-works. On all former occasions they had gone direct to Parliament, and Parliament had never required them to repay loans within a shorter term than fifty years all round. He ventured to hope that the Board would not put them on less favourable terms than Parliament itself had done. The first two items of the estimate were "retort-house and lattice-girder roof for same."

The INSPECTOR: The usual term for buildings is thirty years.

The TOWN CLERK said he was going to ask for fifty years all round, because these buildings were of a very substantial character, and would live for ever, so far as capital expenditure went. Whatever was required to be expended in maintenance would be paid out of revenue. As regarded the retorts, these did not last very long.

The INSPECTOR: Loans are not usually granted for retorts at all, except for a short period on the first installation.

The TOWN CLERK pointed out that the arches which enclosed the retorts would have a life of at least twenty years. As to the remaining item—hydraulic mains, purifiers, exhausters, and condensers—they considered twenty years was a fair computation of their life. Stoking machinery, plant, and accessories, estimated to cost £16,476, were also calculated to last twenty years; while the excavations, foundations, &c., in connection with this item would stand much longer. The coal-stores (£6818) would be maintained in perpetuity out of income; and he set these down as lasting a hundred years. The same in regard to the tar-tank, which was an underground brick building of a substantial character, and would be maintained out of revenue. They had mains in use which were laid down by the old Companies. They were renewed, cleansed, and repaired out of income; and he was instructed to say that seventy years was not a greater term than their life. All things considered, and on proper averages being taken, he trusted that the Board would not go below the term which Parliament itself allowed, and that the Corporation would be permitted to have a term of fifty years all round for the repayment of the loan. He concluded with some general statements as to the status of the city. It had, he said, a net debt of £4,500,000, with assets amounting to upwards of £6,000,000, thus leaving a surplus of £1,500,000. The rateable value was £1,420,366; the total rate—including the School Board rate, but exclusive of poor rate—was 5s. 10d. in the pound; and a levy of 1d. in the pound for city rate purposes would produce close upon £6000.

Mr. LOWDEN remarked that the Town Clerk had stated all the facts; but he should like to emphasize some of them. He then proceeded to enforce the necessity of the works for which the money applied for was needed.

The inquiry then terminated; and the Inspector, accompanied by the members of the Gas Committee and the officials, subsequently visited the New Wortley and Meadow Lane works.

THE CONDITION OF THE MIDDLESBROUGH GAS-WORKS.

Report by Mr. Corbet Woodall.

The views of Alderman Hugh Bell, the Chairman of the Gas Committee of the Middlesbrough Corporation, as to the unsatisfactory condition of the gas-works are to some extent corroborated by a report which Mr. Corbet Woodall, M.Inst.C.E., has submitted to the Committee, upon an examination he has made of the plant and the proposals for its extension. Concerning the general condition of the works, Mr. Woodall says: "I am sorry that, under this head, it is hardly possible to speak in terms of compliment. The area of the land occupied is small for the amount of work done upon it; and at the time of my inspection (Dec. 15), all the plant available was in full work. Coal-waggons were being discharged; and a very large number of persons, with some horses and carts, were assembled in the yard waiting for, or being served with, coke. These are not the circumstances under which such premises are likely to look their best. On the other hand, they are not sufficient to justify the somewhat dirty and dilapidated appearance which the works present. I venture respectfully to suggest that, judged by the results of a term of years, the undertaking will be not less, but more profitable, if there is a liberal expenditure upon general maintenance." With reference to the plant, he remarks that the retorts in the older retort-house are set on an uneconomical system, involving excessive cost for fuel and labour. The new retort-house is well designed, and will, he has no doubt, prove thoroughly economical. The apparatus generally (with exceptions named) is in good condition; and having regard to the exceptions, the working results are remarkably good. The present works are, he states, taxed to the full. Fifty-four additional retorts are now being built; but these are not more than sufficient to bring the productive capacity of the works in line with the present demand. The alternatives to a coal-gas apparatus are the removal of the works to a new site or the erection of carburetted water-gas plant; and of these Mr. Woodall recommends the second. The removal of the works would, of course, involve the sacrifice of a large amount of capital, and would also necessitate much cost and inconvenience from the rearrangement of many of the mains in the town. But by the adoption of carburetted water gas, the land now occupied and available would be made sufficient for many years to come.

AGITATION AGAINST WATER GAS AT LIVERPOOL.

The recent cases of gas suffocation at Garston, Liverpool, have given rise to alarmist statements as to the poisonous nature of water gas, the manufacture of which, as is well known, is carried on at the works of the Liverpool Gas Company in that locality. But the fears which have thus been awakened will no doubt be somewhat allayed by a few remarks made by the Chairman of the Lighting Committee (Mr. C. Petrie), at last Wednesday's meeting of the City Council. The proceedings of the Lighting Committee had been presented for confirmation, when Mr. R. D. Holt submitted that the Committee ought to have a private periodical inspection of the gas, unknown to the Gas Company, so that it could be seen not only whether the standard quality of the gas was being maintained, but whether it was of the proper illuminating power. It was absolutely necessary, he urged, that some means should be adopted to make sure that the Company were dealing fairly with the Corporation, as at present considerable dissatisfaction existed. Mr. Hartley Wilson followed with a question as to whether anything was being done to compel the Company to fulfil their contract and supply the citizens with something more wholesome than that which was at present being sent into their houses. There had, he remarked, already been in Garston several deaths from this "impure" gas; and a great number of people were suffering from various complaints arising from the same cause. Even he himself had been a victim. Replying to these observations, Mr. Petrie stated that the Committee had asked their Inspector (Mr. Bellamy) to get an analysis of the gas supplied from Garston; and he hoped very soon to receive a report. They must not, however, believe everything that had appeared in the newspapers with regard to water gas. It was not luminous, and had to be enriched by oil. There was no doubt that the gas, instead of being too low, was of too high a quality for the burners now in use; and the main point was to find out the best kind of burner for the gas. He was informed that there was no more danger from water gas than from coal or cannel gas. Mr. Crosthwaite complained of the poor illuminating power of the gas supplied in his district, and said they ought to have a report from the Medical Officer as to whether water gas was injurious to health. Mr. Petrie answered that he was informed that water gas was not detrimental to health. Tests of the gas supplied were most carefully taken periodically; and these showed that the candle power was fully maintained. Mr. Holt inquired whether it was not the duty of the Gas Company to change the burners. Mr. Lister declared that the Company had done so whenever complaint had been made; and the Lord Mayor (Alderman Thomas Hughes) said he believed this was so. The subject then dropped.

The principal business before the Garston District Council last Friday was a report by a Special Sub-Committee on the question of the supply of water gas in the district; and it was recommended that a letter in the following terms should be forwarded to the Gas Company: "Herewith we beg to hand you copies of reports on the scientific and medical aspects of the supply and manufacture of water gas in the Garston district, with regard to which an inquiry has recently been held by a Special Committee of this Council. In the course of this inquiry, it has been proved, to the satisfaction of the Committee, that the gas in question is highly dangerous both to life and health; two deaths at least in this district being directly traceable to it, to say nothing with regard to many more or less narrow escapes. This is especially the case in this district, which is, we believe, the only one in the country that is being supplied with unmixed water gas. It is further most offensive to the surrounding neighbourhood in its manufacture; and there is constant and general complaint of the bad smells attending the same. It is, too, a most unsatisfactory illuminant, and most troublesome in its use from the constant filling up both of the ordinary and incandescent burners; and it is further almost useless for the purpose of gas-fires and cooking-stoves, partly from the filling up just referred to, and partly from its deficiency of caloric. While, therefore, we welcome the rumours current of some move on the part of your Board in the near future towards a modification of the evil complained of, by mixing the present undiluted supply of water gas with a proportion of coal gas, we respectfully submit that nothing but an absolute cessation of the manufacture and supply of water gas, with its large percentage of deadly poison, will adequately meet our case; and in view of the admitted fact that the cost of water gas is now, owing to the advance in the price of oil, practically on a level with that of coal

gas, we venture to press this point most strongly—further believing, as we do, judging from the widespread dissatisfaction existing in the district as to the present state of things, that even at the risk of having to pay a little more for the safe article, such a radical change as we suggest would be generally welcomed. In connection with this question of a mixed supply, we may, too, further point out that, as the control of the same would be entirely in your hands, and that therefore it practically could not be known outside, at any given time, how large a proportion of the poisonous water gas was being supplied, a fresh and urgent source of danger would be created through the neglect of the precautions at present in force in many cases against the known evils of water gas in the belief that only a minor proportion of the same was being supplied with the coal gas, and that therefore all danger was probably past." In moving the adoption of the Committee's proceedings, Captain Turner remarked that the manufacture of water gas in the Garston district had been a great source of annoyance to the inhabitants. Two deaths had occurred from it; and he could not help thinking that the Directors of the Gas Company must know that the gas they were manufacturing was of a dangerous character. The motion was carried.

According to the "Liverpool Daily Post," the inhabitants of Garston entertain "a feeling akin to rebellion against the water-gas system;" and it is reported that "a propaganda has been set on foot to get rid of the supply altogether." A representative of the paper has been interviewing some of the inhabitants of the district; and the views expressed are duly recorded in the style common to the new journalism. Hostility has been aroused anew by the fact that a well-known practitioner in Garston was called a few days since to attend a lady who had swooned in consequence, it is stated, of having inhaled gas issuing from the imperfectly closed jets of a cooking-stove. She was promptly conveyed into the open air, and fortunately, with medical assistance, soon recovered.

THE GAS QUESTION AT SOUTHPORT.

Lecture by Professor Lewes.

In view of the public interest aroused in Southport and Birkdale in connection with the proposal of the Corporation of the former town to reduce the illuminating power of the gas supplied in the district—a matter which, it will be remembered, is now under investigation by Major-General Crozier, R.E., on behalf of the Local Government Board—the Gas Committee of the Corporation made arrangements with Professor Vivian B. Lewes, F.I.C., F.C.S., to deliver a lecture on the subject of "Gas and How to Burn It;" and this he did in the Cambridge Hall, Southport, on the evening of the 16th inst. Ample proof was afforded of the desire of the inhabitants to be better informed on the chief point in dispute between the Corporation and the neighbouring District Council of Birkdale, by the large audience which assembled to hear the lecture. The Mayor (Dr. G. H. Pollard, J.P.) presided; and there was a considerable attendance of members of the Corporation. In introducing Professor Lewes, the Chairman remarked that they were all eager to see how the little difference between Southport and Birkdale would be settled. He thought, if he were given a free hand, he could settle it in a very amicable manner; and his suggestion would be that they should get a few representative men from each authority, let them have an expert on either side, and then treat them like a British jury—putting them under lock and key until they had come to a unanimous verdict. Professor Lewes then began his lecture. Commencing with a history of the gas industry, he reviewed the labours of some of the leading scientists in the last century in investigating the phenomena of combustion, and then came to the actual initiation of gas manufacture by William Murdoch. He next proceeded to trace the development of gas-burners from the original cockspur to the batswing in 1816, to the union-jet in 1820, to the argand in 1830, to the regenerative in 1852, and to the incandescent mantle of recent years. Turning to some practical points, the lecturer said if consumers wished to burn gas economically they must be careful to attend not only to the regulation of the burners, on account of the great pressure from the mains, but also to the kind of burners they used. If they employed a flat-flame burner with a globe, let them see that the latter had a wide opening at the base, and was not of the ornamental type. But undoubtedly the best way of getting the utmost value out of gas was to use an incandescent burner, by which they obtained a light of great brilliancy. By using a "Holophane" globe, this light was diffused over a larger area; this being less trying to the eyes than a small, sharply-defined point of light such as they had in the arc light and the uncovered incandescent light. As to the quality of the gas to be consumed, he was strongly of opinion that a 16-candle gas, such as was supplied in London, was preferable to 20-candle gas, not simply because it was cheaper to produce, but because the waste in consumption would be less, and it would not be subject to such variations through changes in temperature. He had that afternoon worked out what was the cost in Southport of light of 60-candle power, burning 2000 hours, by various methods; and the figures were as follows: Gas—Flat-flame burners, £7 18s. 8d.; argand burners, £4 8s.; regenerative burners, £2 1s.; and incandescent mantles, £1 9s. 3d. Oil-lamps—Large, £2 5s.; small, £3 11s. 3d. Electricity, £14 2s. Electricity was still a luxury; but if people chose to pay nearly £8 for what they could get for 30s., he could not say them nay. The lecture was illustrated by some interesting experiments; and at the close a hearty vote of thanks was accorded to Professor Lewes. In responding, he alluded to the existing dispute between the two Local Authorities. He said he thought that if he and Mr. Bellamy (who has been consulted by Birkdale) could have a quiet chat apart from the legal gentlemen, who acted the part of "seconds" in the fight, they could arrive at a solution of the question. It was one which was for the common good of both places concerned; and there should be no difficulty in coming to a settlement. A vote of thanks was also tendered to the Mayor for presiding. Many of the audience afterwards went on to the platform to inspect the burners which had been used for illustrative purposes during the lecture. It is thought locally that one effect of the lecture will be to secure a more general approval of the action of the Gas Committee.

THE MARKET FOR SULPHATE OF AMMONIA DURING THE PAST YEAR.

The "Annual Review of the Market for Sulphate of Ammonia" which has for some years been issued by Messrs. Bradbury and Hirsch, of Liverpool, always contains matter of peculiar interest to readers of the "JOURNAL;" and therefore we are pleased to notice the chief points in the latest addition to the series—that for the year 1896—which was sent out early in the past week, but not in time to be dealt with in our last issue.

In addressing themselves to the task of reviewing the sulphate of ammonia trade in 1895, Messrs. Bradbury and Hirsch first express their sympathy with producers in the trying experiences through which they have been passing. The cloud which has for so long been hanging over this industry has not, they remark, yet passed away; but there are indications that the horizon is clearing, and that the coming season may go far in the direction of placing sulphate in its right position in the manure trade. They then proceed to glance at the agricultural situation and the general manure trade, before discussing nitrate of soda and sulphate of ammonia apart. Depression in agriculture has become more and more acute; and in England the Legislature has had to step in. In Spain, nearly half a million sterling has been appropriated in the 1896-7 estimates to its relief. In Norway, a Committee has been appointed to inquire into the condition of agriculture, and to consider what fresh means should be adopted for relieving it. Foreign competition is alleged as one of the causes of depression. In Russia, a Ministry of Agriculture was created in 1893, for the purpose of ameliorating the situation. In Germany, the matter is much more serious and urgent; and various relief measures have been taken by the Government in recent years, but with only moderate success. In France, things are not so bad; but manure manufacturers know that what was until recent years their best export market has become now one of the poorest—largely, it must be admitted, owing to the establishment of home manure factories, but also largely through the depression in agriculture. Altogether, the condition of agriculture in Europe does not encourage the expectation of higher prices for manures as a whole, though this does not mean that those manures which are now in an anomalous position should not advance to their proper level.

Turning to the general manure trade, Messrs. Bradbury and Hirsch have to record a very unsatisfactory year's working. The season began early—the weather being mild and open; and during the first three months of the year, it gave promise of being an exceptionally large one. But April and May were not so satisfactory; so that anticipation was not altogether realized. Manufacturers, however, did not complain so much about the extent of business as about the quality of it. The tendency, it appears, is still in the direction of using superphosphates and the cheaper compounds, to the neglect of the higher-class manures, on which there should be a larger margin of profit; and if this is true about the home consumption, it is also true about export business.

Coming to nitrate of soda, we find that the year opened with an unprecedentedly large visible supply, and without any combination among producers. Hence everything pointed to a low range of prices and to a consumption beyond any previous record. The Combination was reconstituted early in February, and none too soon to save the trade from serious disaster, notwithstanding the early season and consequent heavy deliveries in the opening months of the year. It had the effect of steadying the market; and, thanks to it, spot prices did not fluctuate more than 4½d. per cwt. throughout the year. The closing spot price was 8s. per cwt. for fine quality of nitrate, as compared with 7s. 9d. at the end of 1895. The visible supply (stock and afloat) at the end of 1894 was 500,000 tons; at the end of 1895, 660,000 tons; and at the end of 1896, about the same quantity. The deliveries, January-April, 1895, were 505,000 tons; January-April, 1896, 580,000 tons.

At this point, Messrs. Bradbury and Hirsch offer a few remarks on the new fertilizing agent "Nitragin," which was noticed in the "JOURNAL" for Sept. 29 and Oct. 27 last. Dr. Voelcker has dealt exhaustively with this subject in the "Journal of the Royal Agricultural Society" for June 30, 1896, as well as in a paper which came before the London Section of the Society of Chemical Industry, and was given in the "Journal" of the Society for the 30th of November. To all these sources our readers may be referred for information respecting this material. Messrs. Bradbury and Hirsch remark concerning it that, assuming all that is claimed for the new method of manuring is realized, it is bound to materially affect the value of all nitrogenous manures; but much will have to be learnt, no doubt, in the way of application, conditions necessary in the soil, &c., before it can become an established success. They think we shall doubtless hear more, if the larger experiments now on foot are successful; but, for the present, they consider that "Nitragin need not disturb our calculations."

In their "Review" for 1895, Messrs. Bradbury and Hirsch expressed the opinion that, while the then heavy stock of sulphate of ammonia remained in makers' hands, there did not appear to be any prospect of much improvement in price. And they added: "If makers now put it upon the market, as they seem disposed to do, we are afraid that the worst has not been experienced." Commenting upon this in their present "Review," they make the following remarks:—

"Had the makers maintained a firm attitude, although we considered their policy of stocking mistaken in the first instance, we thought that prices might have improved to something like the unit level of nitrate of soda. Our words were, however, scarcely in print before the makers in question came out as free sellers, not only for prompt, but also for delivery over the spring months. The immediate consequence was a drop in the spot market, and offering on the part of speculators for forward delivery at prices below those quoted by makers. Thus the weakness of the makers enabled speculators to cover their immediate and near requirements, while it encouraged them to pursue further the 'bear' policy they had found so successful during the preceding twelve months. Throughout February, there being large demand, and the

Combination of Nitrate of Soda Producers having been reconstituted, prices remained steady; but in March the London makers again came out as sellers, and previous experience was repeated. The spot market collapsed all round, and 'bear' speculators again took the field with renewed vigour and greater daring; their quotations for autumn delivery being only 2s. 6d. to 5s. per ton, according to position, above spot values, while for up to the end of June there were sellers at practically spot prices.

"In April, not to be out of the hunt, London, Scotch, and Continental makers began to offer for forward delivery—some of them up to the end of March, 1897; and a considerable business was done for July-September at £8 5s., and July-March at £8 10s. per ton f.o.b., or at the equivalent. In May, however, owing to continued large exports, and consequent firm spot market, sellers, especially makers, became more reserved, and there were ready buyers at prices freely quoted in April. At this time business was reported done for delivery early in 1897 at £8 12s. 6d. per ton f.o b. Leith. June saw the market back to the April position, with buyers altogether indifferent. In July there were speculative sellers for three months ahead at spot prices, and up to the end of the year at a trifling premium; but makers did not enter the competition—being unwilling to accept the prices quoted. From this time onward, speculators dominated the market; plying buyers with continually reduced quotations, until in October as low as £7 10s. was accepted for January-June, 1897, delivery, and spot prices for November and December. The situation in October had been skilfully worked up to; and circumstances had altogether favoured 'bear' speculation. The autumn demand had been altogether disappointing; the exports for July onwards having fallen below those of 1895 during the same period, and the autumn off season having arrived with rapidly-increasing production. If the position of speculators was somewhat critical, the outlook for the large makers, especially those who held heavy stocks, seemed to be desperate.

"Speculators had purposely deferred covering October sales until late in the month, in order to further depress the market, but more with an eye to the future than to the then present. They had a heavy forward account open; and they were aware that the covering of October sales must inevitably improve the market, and spoil their chances of buying forward. Moreover, it seemed doubtful whether a more favourable opportunity would arise later. It was essential to the success of their game that forward and spot should be covered simultaneously; and this was most skilfully accomplished by the leading operators—it being estimated that at this time quite 20,000 tons passed into their hands, prompt, November-December, and January-June delivery. Those left out in the cold immediately rushed in to get themselves covered; and within a fortnight the market advanced something like £1 per ton. Consumers only partly followed the advance, and when, in the third week in November, speculative buying fell off, they withdrew altogether; so that by the end of the month quite half of the advance had been lost. In December there was a further decline; but towards the close of the month, the market again hardened—there being at that time good demand both for prompt and forward delivery. At the close of the year, the outlook was brighter than it had been for a long time. The level of prices reached is calculated to induce a much larger consumption than in any previous year; and it has already attracted the attention of consumers who have hitherto used nitrate of soda. The London and the Scotch makers are heavily sold ahead; and they decline to offer further unless at what appear at present to be prohibitive prices. Probably a preponderance of the speculative interest is now on the 'bull' side; and such 'bears' as there are seem very nervous about offering for delivery beyond the month of January.

"It will be seen that the history of 1895 has repeated itself, though in the first half of 1896, owing to heavy exports and good home demand, there was not a very wide margin for 'bear' operators. In the second half of the year, however, there was a good margin, and handsome profits must have been realized. Must, then, the misfortunes of sulphate of ammonia producers be attributed mainly to the action of speculators? Fairness compels us to say that, although speculators took fullest advantage of circumstances as they arose, they were not responsible for the circumstances. We attribute the present situation, first, to the policy which left in the hands of producers stocks altogether unprecedented in the history of the trade; secondly, to the falling away in exports during the second half of the year; and, thirdly, to the operations of 'bear' speculators, who took fullest advantage of the two circumstances mentioned to depress the market. The fact is the trade has been paying for the past mistaken policy in stocking production; and we are not sure that the last instalment has been paid."

Messrs. Bradbury and Hirsch go on to remark that it is difficult to account for the falling off in exports after June, having regard to the tempting price at which sulphate of ammonia could all along be bought. There was not an actual decrease as compared with the exports in the second half of 1895, but a cessation of the large increase—about 15,000 tons—manifested in the first six months of the year, as compared with the same period in 1895. Certainly, there was no displacement by nitrate of soda or other manure. But why, they ask, should there have been a satisfactory increase in exports of sulphate of ammonia during the first six months of the year, and practically none in the last six months? And they answer: For the reason that the increase during the first six months was mainly in displacement of nitrate of soda; and as deliveries of nitrate in the United Kingdom and on the Continent during this period were 690,000 tons, against 260,000 tons in the second half of the year, it follows that, if there was displacement, it must have been mainly during the season of heavy deliveries of nitrate of soda. Sulphate producers, they say, are labouring under a serious misapprehension in thinking that nitrate has been displacing their product, at any rate in recent years. Nothing of the kind has taken place, at all events, since 1893-4, when inflated prices for sulphate gave a fillip to the use of nitrate. Where nitrate has made progress on the Continent, it has been on new ground, where it has been advertised and pushed. On the older ground and in the United Kingdom, it has barely held its own. It does not seem to be appreciated that within the past six years the world's consumption of nitrate has only increased about 12 per cent.; while the increase in the consumption of sulphate in Europe within the same period has been probably 50 per cent. In cases where sulphate has been displaced, it has been by other sulphate. Such displacement as there has been in Germany, for instance, has been by sulphate produced in Germany and Belgium; and the wonder is rather that English sulphate has so well held its ground. The United Kingdom production within the past ten years has increased something like 80 per cent.

The depressed and anomalous position into which sulphate has fallen in the manure trade has very naturally engaged the attention of producers; and within the past six months, many proposals have been made by members of the Producers' Association and others with the object of bringing it back to its proper level. Messrs. Bradbury and Hirsch devote the next portion of their report to a criticism of these proposals from a commercial and practical standpoint. They observe that, if it is sought to advance the price of an article, one of two things must be done—either production must be reduced or consumption increased. There can be no question that curtailment of production would be the most immediately effective method of adjustment, if it were practicable, in the case of sulphate of ammonia. But they venture to say it is not. In the first place, being a bye-product, the rate of its output depends upon altogether other things than its own market price. The output cannot be materially reduced, therefore, when the market price is low. Producers might, of course, combine to withhold supplies, and by this means bring available supply into relation with demand. But what, they ask, would be done ultimately with the stock so held back, assuming production to be in excess of consumption? Manifestly it could not go on accumulating for an indefinite period, and especially in the face of largely-increased and rapidly-increasing foreign production. It would have to be "slaughtered" sooner or later. When production is in excess of demand, stocking does not pay. When the position is reversed, stocking is not necessary—the market can then very well take care of itself. But even if reduction of output were practicable, the next question is: Would it be possible to effect a combination of producers? They think not. They question whether all the local authorities who are sulphate producers either would or could join it, whatever private concerns might do. Much less would they, or could they, combine for the purpose of stocking, which would, of course, be in the nature of speculation.

Passing to the question of increasing the consumption of sulphate of ammonia, Messrs. Bradbury and Hirsch remark that, in the opinion of some, it is simply a question of advertising, as the producers of nitrate did a few years ago. The authors, however, think there is more in it than this; and their view was supported by Mr. Carulla in his recent address to the Nottingham Section of the Society of Chemical Industry.* While admitting that the literature that arose around the famous nitrate of soda prize essays must have benefited the nitrate industry, he pointed out that before that time there were low prices in the sulphate market; and, in his opinion, the adjustment of the relative positions of sulphate and nitrate in the manure trade lay in education rather than in advertisement. The authors think he is right. Their view of the whole matter is this: Let sulphate of ammonia producers combine to experiment and investigate, to educate and to advertise, and it must inevitably open the use of their product to a wider field, and so improve the market value of it. They admit that the process can at best be only slow—altogether too slow to affect the present situation, or even the near future; but they venture to predict, and with confidence, that sulphate will have righted itself long before any serious impression can be made by means of education and "booming." With regard to the suggestion that producers should combine to fix uniform prices (at a substantial advance, of course, or there would be no advantage in it), Messrs. Bradbury and Hirsch think this would be creating artificial prices for the benefit of foreign producers, who could then dominate their own markets, and get rid of all their production, while leaving the United Kingdom producers "sitting upon a considerable portion of theirs." They think it is not a proposal likely to find large acceptance in the absence of an absolute monopoly of production. Then it has been suggested that the middleman should be got rid of. But how? The authors point out that "he is an institution no other important trade has ever been able to extinguish;" and they are afraid that in sulphate of ammonia he has also "come to stay."

Looking at the production and consumption during the past year, Messrs. Bradbury and Hirsch remark that it is satisfactory to find that the latter has more than overtaken the former. The production in the United Kingdom during 1896, from all sources, they estimate at 189,000 tons, viz.:—

	Tons.
Gas-works	124,000
Iron "	18,000
Shale "	39,000
Coke and carbonizing works	8,000

Of the total production, they reckon that England contributed 116,000 tons; Scotland, 70,000 tons; and Ireland, 3000 tons. The production during the previous five years was as follows:—

	1895.	1894.	1893.	1892.	1891.
Gas-works	119,600	113,500	112,000	110,750	107,950
Iron "	14,600	10,000	8,800	11,000	6,300
Shale "	38,300	33,000	28,500	23,100	26,600
Coke "	7,000	3 500	3,200	5,000	2,800
Totals.	179,500	160,000	152,500	149,850	143,650

During the past year, there was a substantial increase in production, though there was nothing exceptional about it. With regard to consumption, the exports amounted to 127,000 tons, as compared with 112,000 tons in 1895—an increase of 15,000 tons. One feature in connection with the exports is specially mentioned by Messrs. Bradbury and Hirsch—viz, that while shipments to Germany and Belgium (a large portion of those for the latter country finding their way into Germany) show an increase of 3000 tons, notwithstanding increased German production, the exports to France, where home production has also increased, show an advance of about 5500 tons upon those in 1895. This, they say, is significant. It means that the consumption of sulphate has been making greater progress than that of nitrate, on

* See "JOURNAL," Vol. LXVIII., p. 1183.

ground which nitrate has been in the habit of considering all its own; and it holds out the hope of further progress in the same direction.

The exact situation is this: Production has increased 10,000 tons, while exports have increased 15,000 tons. Home consumption is difficult to estimate; but if the advance is taken at 4000 tons, it will probably not be outside the mark. This makes the total augmentation of consumption (home and export) 19,000 tons—or 9000 tons in excess of the increase in production. But then the year commenced with a stock of probably 29,000 tons; so that at the close of 1896, there was still the heavy stock of 20,000 tons to be reckoned with. The tendency is thus in the direction of the adjustment of demand to supply; and everything will depend, in the present year, upon whether the rate of progress experienced in 1896 is maintained, and upon how the large stock referred to is handled. Messrs. Bradbury and Hirsch attributed the increase in the exports of sulphate during the first half of 1896 mainly to the displacement of nitrate of soda; and they are of opinion that, in the coming season, further increased consumption must depend mainly upon this cause. With regard to the stocks in makers' hands, it is understood that most of these are sold for delivery ahead; and if it is the fact, as the authors think it is, that the buyers of them are now interested in higher prices, they will doubtless use their best efforts to support the market, instead of, as before, to depress it. They therefore think the outlook is hopeful, and that higher prices may reasonably be expected as the season advances. In their judgment, however, it would be a mistake to force the advance very rapidly—at any rate, until the stocks are taken up by consumers, or absorbed to a considerably greater degree than is the case at present. They say it would check the displacement of nitrate, and put back the time when sulphate producers may be able to command prices for their product at least relatively equal to those obtained for nitrate. Hence they recommend patience, especially as it can now be clearly seen that sulphate is "working out its own salvation."

Messrs. Bradbury and Hirsch then proceed, as usual, to record the course of the market month by month; and this is followed by the customary tabulated statistics. The first table contains the comparative weekly prices of sulphate of ammonia and nitrate of soda last year; while the second gives the average prices per ton of good grey (24 per cent.) sulphate, f.o.b. Hull. This table is specially interesting; the figures ranging over a period of 30 years—1867 to 1896. The following are the averages for the past eleven years: 1886, £11 3s. 7½d.; 1887, £11 17s. 8d.; 1888, £11 18s. 0½d.; 1889, £12 1s. 4½d.; 1890, £11 9s.; 1891, £10 15s. 5d.; 1892, £10 1s. 10½d.; 1893, £12 11s. 4½d.; 1894, £13 3s. 8½d.; 1895, £9 15s. 4½d.; and 1896, £7 18s. 0½d. The third table shows the average prices per hundredweight of 95 per cent. nitrate of soda, in Liverpool, for the past eleven years. They are as follows: 1886, 9s. 9d.; 1887, 9s. 6d.; 1888, 9s. 9½d.; 1889, 9s. 2½d.; 1890, 8s. 2d.; 1891, 8s. 9½d.; 1892, 8s. 9½d.; 1893, 9s. 5½d.; 1894, 9s. 4½d.; 1895, 8s. 2½d.; and 1896, 7s. 11½d.

THIRLMERE WATER FOR WIGAN.

Local Government Board Inquiry.

Last Tuesday, Colonel ORD HASTED conducted an inquiry at Wigan in regard to an application by the Corporation to the Local Government Board for a Provisional Order, to enable them to construct water-works outside the borough, and to take a supply of water from the Thirlmere aqueduct of the Manchester Corporation.

The TOWN CLERK said the application had been necessitated by the increased population of the borough, which had grown, from 1861 to the present time, to the extent of 25,000. The proposal was in short to construct a line of pipes from the service reservoir at the top of Wigan Lane (which supplied the whole of the borough by gravitation) to the aqueduct conveying water from Lake Thirlmere to the city of Manchester. Terms had been arranged between the two Corporations, subject, of course, to the application being accepted by the Local Government Board, and to the powers now applied for being granted for the supply of 200,000 gallons per day in perpetuity, according to the terms and prices fixed by the Manchester Act of 1879. By section 81 of the Act, the Inspector would see that it was necessary two years' notice should be given before the Manchester Corporation could be called upon to furnish a supply of water in accordance with the terms of the Act. They had, however, agreed to waive that two years' notice; so that, if the Local Government Board consented to the arrangement proposed, the supply could be turned on as soon as the connections were made. The pipe-line would pass through the townships of Standish, Worthington, and Adlington, and end in Anderton. They had been in negotiation with the various local authorities, and also with the owners of the Adlington Park estate, which was the only private land through which the pipe-line would pass; and they had practically agreed to terms all through. The capacity of the present reservoirs was 250 million gallons. It was very important, if it could be done, that they should have the power to purchase the pipes and construct the works as soon as possible, as the Corporation would not like to be in the same straits as they were in last autumn.

Mr. H. ACKERLEY asked that some arrangement might be made whereby Worthington could get water from the Wigan pipe-line.

Mr. JOLLEY, on behalf of the Chorley Rural Sanitary Authority, said the township of Coppull now obtained its water from Standish; but it was liable to be cut off on a five years' notice. They therefore wanted a clause inserted in the Provisional Order to enable them to procure water from Thirlmere through the Wigan Corporation, if such notice were given. He also appeared for the Adlington District Council, who were afraid that their present supply, which was derived from Blackrod, would become insufficient. They desired the Local Government Board to insert a clause empowering the Corporation to supply that part of the district west of the Lancashire and Yorkshire and the Lancashire Union Railways, on terms to be inserted.

Alderman *Richards*, Mayor of Wigan and Chairman of the Water Committee, said it was impossible to obtain more water from their present gathering-ground. Last autumn they had only a few days' supply; and it was decided to approach the Manchester Corporation, and arrange with them to take 200,000 gallons per day from the Thirlmere aqueduct. In his opinion, the additional quantity would make Wigan safe for some years; but he did not think they would be able to stand any deduction from the amount to supply other authorities.

The TOWN CLERK said if the Local Government Board thought they ought to supply the districts on the pipe-line, they might have to make a fresh arrangement with the Manchester Corporation as to the amount of water to be taken.

Mr. *W. Bolton*, the Borough Engineer, stated that the present gathering-ground was chiefly agricultural land; and the supply was now 17 gallons per head. The cost of the proposed works was estimated at £11,929

The INSPECTOR suggested that, as the application was for £12,000, it did not leave sufficient margin.

The representatives of the Corporation present thereupon agreed as to the advisability of increasing the amount to £15,000.

Mr. *W. J. Orsman*, the Borough Analyst, gave evidence to the effect that the mixing of the Wigan and Thirlmere waters would improve the former.

Mr. BLACKSTOCK (on behalf of the Manchester Corporation) said the application only referred to the Wigan Corporation; and the Manchester Corporation had never entertained any application from outside sources in the manner suggested that day.

The TOWN CLERK: Would Manchester allow Wigan to supply the districts *en route*?

Mr. BLACKSTOCK replied that there would have to be a separate application. Manchester were not seeking, nor were they anxious, to supply other authorities. They were using 8 of the 10 million gallons of water supplied from Thirlmere; so that these extensions were very important to them.

The inquiry then terminated.

THE WATER SUPPLY OF PARIS: ITS RISE AND PROGRESS.

Continuing our notice, commenced on the 12th inst., of the report on the above subject presented to the London County Council by their Chief Engineer (Mr. A. R. Binnie, M.Inst.C.E.), we have now to deal with the various sources of supply.

The Gravitation Supplies.

In 1863, in order to satisfy the urgent requirements of parishes on the right bank of the Seine, the Austerlitz pumping-station of 217·26-horse power was constructed on the left bank of the river, to supply water to the reservoirs of Gentilly and Charonne. The average annual quantity of water thus pumped was 1188 million gallons; and the total cost amounted to £68,020. Notwithstanding these improvements, certain districts were still insufficiently supplied. The greater portion of their inhabitants only obtained water by the St. Ouen pumping-station from the Seine below the Asnières sewer; and it was absolutely unfitted for domestic use. This state of affairs was eventually remedied by the construction of the Dhuis aqueduct for the supply of water by gravitation for domestic purposes, and by a further supply obtained from the Marne by a pumping-station at St. Maur.

This, the first gravitation scheme, was for tapping the upper waters of the Dhuis, a tributary of the Marne, situate at a distance of more than 80 miles east of Paris. Legislative sanction was obtained in 1862; and the works were commenced in 1863. They were executed with such rapidity that the water was first introduced into the aqueducts on Aug. 2, 1865; and its regular distribution to the consumers commenced on Oct. 1 of the same year. The total length of the aqueduct is 81·5 miles, with a general fall, including syphons, of 10·3 inches per mile. The daily quantity of water brought by this aqueduct and discharged into the reservoir at Ménilmontant, at a level of 354 feet, is about 4,400,000 gallons. The annual amount distributed being, on an average, 14.520 million gallons, gives a cost per metre supplied of 1·07d., or 4·88d. per 1000 gallons. This aqueduct for the supply of the high-level zone cost a total sum of £720,000, including pumping-stations, purchase of land, &c.

The Ménilmontant reservoir, supplied by the above, is in two floors. The lower basin has a capacity of 6,270,000 gallons, and receives the waters of the Marne, pumped at the St. Maur station. The top water-level is 328 feet. The upper basins have a capacity of 20,000,000 gallons. They are covered over, and supported on the lower basins by piers. The superficial area of the reservoir is 5 acres. A later return gives 26½ million gallons as the total present capacity; being 6 million and 20¼ million gallons for the lower and upper floors respectively. The total cost amounted to £164,000, including the land and accessory expenses, which works out, per cubic metre of available capacity, to about £1 6s. 4d., or £5 19s. 8d. per 1000 gallons.

In 1864, in order to meet the public requirements of the higher districts, a hydraulic pumping-station was established on the left bank of the St. Maur canal. It consists of seven hydraulic motors, four of which were Girard turbines and three Fourneyron turbines, furnishing a total of 770·3-horse power. This station supplies the Gravelle lake with 2,640,000 gallons, feeding the lakes and streams of the Bois de Vincennes, and delivers from 5 720,000 to 7,260,000 gallons of water from the Marne to the Ménilmontant reservoir for public services, *plus* 1,100,000 gallons from an underground source which is delivered into an upper basin of the same reservoir for domestic supplies; making a total of 9½ to 11 million gallons of water. This station cost £345,260.

In 1863, the Belleville reservoir was commenced, and finished in 1864. It was for the purpose of supplying the higher quarters of the district. It is in two stages. The upper, supplied with the Dhuis water, has a capacity of over 1,300,000 gallons, and a top water-level of 440·83 feet. The lower compartment is fed by Marne water. Its capacity is nearly 2,600,000 gallons, with a top water-level of 430 feet. The water supplying this reservoir is drawn from the Ménilmontant reservoir by a pumping-station or lift, dating from May 5, 1867. The pumping main is 3270 feet long, and 11·8 inches in diameter. The total cost of the reservoir was £18,580; being £1 0s. 9½d. per metre of available capacity, or £4 14s. 6d per 1000 gallons.

After the construction of the Buttes Chaumont, it was found that the park could not be supplied without unduly exhausting the Ménilmontant

reservoir; thereby reducing the public supplies to two parishes. It was therefore decided to construct a reservoir within the Buttes Chaumont, to be supplied with Ourcq water drawn by pumping from the Villette basin. These works were commenced in 1866, and completed in 1867. The total capacity of the reservoir is 1,936,000 gallons; and the top water-level is 317·8 feet. This reservoir also supplies the cattle market and the public slaughter-house of Villette.

The next gravitation scheme to be undertaken was that of the Vanne. This is a small river which rises in the department of the Aube, at Fontvanne, near Estissac. It is a tributary of the Yonne, one of the branches of the Seine, and is tapped at upwards of 100 miles south-east of Paris. The works were commenced in 1867; but in consequence of the Franco-German War, they were not finally completed until 1874. This supply differs from the Dhuis scheme in being not entirely a gravitation one. It is fed from a series of springs or streams spread over the valley between Sens and Iroyes. These springs form two groups, of which one, called the upper level, supplies the main aqueduct solely by gravitation; while the other, called the lower level, has to be raised by pumping, either by water power from the Vanne, by the natural fall from the upper level, or by steam power. The upper level furnishes a supply of at least 8,800,000 gallons in 24 hours, and at times rises to 28,600,000 gallons. The lower level gives a somewhat variable supply, but rarely falls below 8,800,000 gallons per 24 hours. There are three pumping-stations for raising the waters of the lower level to the upper. The length of the aqueduct is 107½ miles; and the main aqueduct has a diameter varying from 6·56 to 6·89 feet. The syphons crossing the valley are in two lines of cast-iron pipe, with an interior diameter of 3·6 feet. The aqueduct commences at a level of 364·64 feet, and has a total fall of 102·24 feet. The total cost amounted to £1,560,000. The quantity of water brought from this source being 8030 million gallons per annum, the cost per cubic metre of water supplied comes to about 0·42d., or 2d. per 1000 gallons.

The Montrouge reservoirs receive the waters supplied by the above-mentioned aqueducts. They are constructed on the type of the Ménilmontant reservoir, in two stages, each in two compartments, with a total capacity of 43½ million gallons. The total cost of these reservoirs, including the purchase of lands, works, and extra foundations, amounted to £272,000. The price per cubic metre is 4s. 3¾d., or 19s. 7d. per 1000 gallons. The trunk mains for the distribution of this supply cost £128,000.

In 1881, a new gravitation supply was commenced from Cochepies, near Villeneuve-sur-Yonne. It was finished in 1888, and furnishes a supply of pure spring water of never less than 4,400,000 gallons per day. This source being only 6·21 miles from the Vanne aqueduct, it is raised thereto by a pumping-station of 197·51-horse power. The total cost of the above works was £103,000. This supplemental supply necessitated an enlargement of the Vanne aqueduct, entailing an extra cost of £24,000. It raises the total quantity of water brought in by the Vanne aqueduct to 26½ million gallons.

As these several supplies entered Paris at altitudes insufficient to supply the highest parts of the City, various pumping-stations and reservoirs were constructed to remove the difficulty. Some of these were of a temporary character, and were eventually abolished or applied to other purposes.

The above supplies have within the past few years been considerably augmented by the construction of the Avre aqueduct, which brings 22 million gallons of water daily a distance of 62½ miles, from the Avre, a tributary of the Eure, on the borders of Normandy. The conduit of 5·9 feet in diameter is supplied by five springs (of which the lowest is 478·8 feet above the level of the sea) rising in the neighbourhood of Verneuil. It discharges at a level of 334·5 feet into a covered reservoir situate at St. Cloud, having a capacity of 22 million gallons—a capacity which will require to be eventually doubled or trebled. The syphons crossing the valleys are in two lines of cast-iron pipes 3·28 feet in diameter. The total cost of this scheme, including compensation, amounted to £1,400,000.

Canals and Artesian Wells.

As already mentioned, the supply from the River Ourcq was first seriously entertained in 1797; but the scheme was not finally sanctioned until 1802, and the water only first introduced in 1809. The final completion of the scheme as originally intended was undertaken by a company, whose rights and privileges, however, were re-purchased by the City in 1876. The total length of canal and of river utilized is 67 miles. Though the total volume supplied by this canal to the Villette basin should amount to about 56 million gallons per day, it is considerably reduced at times by infiltration, and by stoppage of the hydraulic pumps during floods; falling often to as low as 38½ million gallons per day from these causes. This canal, besides acting as an aqueduct for the supply of water for trade and public purposes, holds an important position as a navigable artery. The traffic in 1888 was represented by upwards of 492,000 tons of goods and materials entering Paris; and it often has been considerably higher—notably in 1882, when it rose to above 984,000 tons.

The Villette basin is practically a part of the Ourcq canal; being, in fact, its terminus, as also a feeder to the St. Denis and St. Martin canals, and a reservoir for the distribution of water to Paris for trade and public purposes. The former canal was part of the same concession as that of the Ourcq canal, from which, in fact, it derives its supply. It was opened in 1821, and has a total length of 41·3 miles from Villette to its outfall into the Seine. The St. Martin canal, though comprised in the same Act which sanctioned the Ourcq and St. Denis canals, was a concession, dated 1822, to the Ourcq and St. Denis Canal Company. It was opened to navigation in 1825. The concession was transferred to the City by treaty in 1861, in consideration of an annual payment of £7200, expiring in 1922. The total length of this canal from the Villette basin to its discharge into the Seine is 28·3 miles.

There are four artesian wells, the yield of which is applied essentially to trade and public purposes. The first well to be sunk was that of Grenelle, already described. The well at Passy was commenced in September, 1855, and completed in September, 1860. The boring passed through the chalk formation, and tapped the greensand at a depth of about 1920 feet from the surface. The supply at first was 3,630,000 gallons in 24 hours; but not long ago it was only about 1,364,000 gallons. The water is employed for feeding the lakes in the Bois de Boulogne.

The success of the Passy well initiated the idea of establishing at the extreme north and south of Paris two other artesian wells for the supply of water for trade purposes. The first of these wells, situate in the Place Hébert, was commenced in 1863, stopped in 1874, re-commenced in 1883, and water found in the greensand at a depth of 2312 feet; but the boring was continued down to 2355 feet, where a yield of 440,000 gallons per 24 hours was obtained. In consequence of various unforeseen accidents, this yield was not finally maintained. The total cost was something over £80,000. The sinking of the second well, at Buttes aux Cailles, was also commenced in 1863; but Mr. Binnie believes it is incomplete.

Comparison of Supplies from all Sources.

In 1878, the total supply from all the previously described sources may be said to have been as follows:—

Public and Trade Purposes.

	Gallons per Day.
From the Ourcq	23,100,000
„ Seine	19,360,000
„ Marne	9,460,000
Arcueil supply and the supplies from the artesian wells of Passy and Grenelle	1,540,000
Total	53,460,000

Domestic Purposes.

From the Dhuis	4,400,000
„ St. Maur springs	1,100,000
„ Vanne	22,000,000
Total	27,500,000

Together, 80,960,000 gallons, or at the rate per head per day of 38½ gallons for a population of 2,100,000.

In 1889, the total available quantity of water supplied to Paris from the above various sources—river, spring, and canal—had risen to the following figures:—

Public and Trade Purposes.

	Gallons per Day.
From the Ourcq	29,700,000
„ Marne	19,800,000
„ Seine	52,800,000
Arcueil supply and artesian wells	1,760,000
Total	104,060,000

Domestic Purposes.

From the Dhuis and St. Maur springs	5,500,000
„ Vanne	26,400,000
Total	31,900,000

Together, 135,960,000 gallons. Of this quantity, 123,200,000 gallons might be considered as the average amount actually available, which, for a population of 2,300,000 persons, would give a rate of 53½ gallons per head per day. The aggregate length of mains at this period had risen to 1294 miles.

The last census (in 1891) gave Paris a population of 2,400,000 persons. It may safely be assumed, therefore, that the population in 1894 was 2½ million persons, of whom all are directly or indirectly supplied with water by the Municipality. The average quantity thus distributed in March in that year may be apportioned in the following manner—

	Gallons.	
Domestic purposes	35,200,000 or 14·1	per head per day.
Trade „	30,800,000 „ 12·3	„
Public „	44,000,000 „ 17·6	„
Total	110,000,000, or 44·0	per head per day.

But the service is organized in such a manner that it can supply, even in the hottest season, as follows:—

	Gallons.	
Domestic purposes	52,800,000, or 21·12	per head per day.
Trade and public purposes	110,000,000 „ 44·00	„
Grand total	162,800,000, or 65·12	per head per day.

This is more than double the quantity and nearly double the rate in the year 1879. The aggregate length of public mains in 1894 was about 1400 miles.

Revenue and Expenditure.

Passing over the section of the report dealing with the delivery and the charge for water, we come to the portion giving the figures of revenue and expenditure. Modifications introduced in the tariffs after 1881 produced a notable diminution in the charges to the consumers. The average annual subscription rate collected, which was formerly £7 3s. 9d., had risen in 1880 to £7 9s. 3½d., but was only £6 2s. 4½d. in 1889. The receipts show a marked diminution in their yearly increment. From 1878 to 1880 the increase was £40,720; from 1880 to 1882, it was not more than £18,720; from 1882 to 1884, £2960; from 1884 to 1886, £7400. The following are the actual amounts received and expended in 1888:—

Receipts.

Water-Rates received	£408,000
Payments from public buildings, non-municipal	12,400
Sundries	1,200
Total	£421,600

Expenditure.

Annuity to Compagnie Générale des Eaux	£46,400
Premium to the Company on their receipts	56,000
Working expenses	90,800
Staff, office expenses, &c.	18,800
Total	£212,000

To these annual expenses of maintenance, management, &c., must be

added the interest of the sums expended on works executed since 1865 at the time of the loan, which had not been paid off. These sums amounted to £6,240,000, on which the interest at 4 per cent. would be £249,600. The annual charges on the finances of the City for the administration of its water supply were therefore, in 1888, £461,600, or over £40,000 above the actual water-rental. But if the water supplied for public purposes, or (say) 40 per cent. of the total, were estimated at the usual rates, the Municipality may then be said to have been receiving a small, but still a remunerative, profit upon their capital expenditure.

In 1894, the gross income from the sale of water for domestic and trade purposes, excluding water employed for public purposes, may be said to have been about £520,000 per annum; and the net revenue, after deduction of expenses for maintenance, management, &c., and payments to the Company, would come to £240,000 per annum. The above expenses of maintenance, management, &c., not including those of the Company, amount to somewhat over £160,000. On a population of 2½ millions, the gross revenue would therefore be 4s. 2d. per head; and the net revenue, after deducting expenses for maintenance, management, &c., and payments to the Company, would amount to 1s. 11d. per head of population. The first cost, or the capital represented by works, may be estimated at £11,200,000. It is impossible to state precisely the amount of profit derived from this capital expenditure; but after deducting all charges (annual payments to the Company, maintenance and management, &c.), and leaving out of account the water used for public purposes, the net receipts would represent an interest on the above capital of about 2 per cent.

Comparison between London and Paris.

Mr. Binnie next deals at some length with the regulations and tariff for the supply of water in 1880, and the regulations as to meters; and then closes his report with some general observations. At the end of these, he gives the following comparative table, showing the difference between London and Paris as regards the quantity of water supplied, the capital invested, and the revenue and expenditure:—

London in 1892.

Total supply daily	173,500,000 gallons,* or (say) 33 gallons per head for a population of 5¼ millions.
Income from water-rates	£1,891,784, or 7·15d. per 1000 gallons.
Income receivable	£2,004,155, „ 7·57d. „ „
Maintenance and management	£750,589, „ 2·84d. „ „
Net income	£1,141,195, „ 4·31d. „ „
Capital raised	£15,029,568.
Total expenditure for works	£15,314,204.
Gross income per head	7s. 2d.
Net income per head	4s. 4d.

Paris in 1894.

Total available supply	162,750,000 gallons, or (say) 65 gallons per head for a population of 2½ millions.
Gross income from water	£520,000, or 2·10d. per 1000 gallons.
Maintenance and management	£160,000, „ 0·65d. „ „
Net income	£240,000, „ 0·97d. „ „
Capital expenditure for works	£11,200,000.
Gross income per head	4s. 2d
Net income per head	1s. 11d.

Brentford Gas Company.—At the forthcoming half-yearly meeting of this Company, the Directors will recommend dividends for the six months ending Dec. 31 at the rates of 5, 12, and 9 per cent. per annum.

Colne Valley Water Company.—At the half-yearly general meeting of this Company on the 9th prox., the Directors will report a profit of £5303 in respect of the revenue account, for the six months ending Dec. 31. There is a sum of £3939 standing to the credit of the dividend and interest account; and after payment of the usual 4 per cent. interest on the debenture stock and preference shares, and transferring £250 to the old engines suspense account and £100 to the reserve account, it is proposed to pay out of the balance a dividend on the ordinary shares at the rate of 4½ per cent. per annum, less income-tax—leaving £424 to be carried forward.

Gas Explosion at Nine Elms Station.—Last Wednesday morning, an explosion of gas occurred under unusual circumstances in one of the engineering shops of the London and South-Western Railway, at Nine Elms. Its force was sufficient to destroy an engine-tender, and to blow off the roof of the building in which it stood. Fortunately, the men had not started work; and the accidents were consequently few. It appears that certain repairs were being made on a tender tank; and the holding-up boy inside was lighted by a gas-jet supplied by a flexible pipe. When he left his work, he did not turn off the gas, but replaced the lid of the tank. In about an hour the gas was extinguished for want of air. An explosive mixture was then produced; and when the tank-lid was opened, and the boy proceeded to enter with a light, the explosion took place, with the effect stated.

The New Water-Works at Richmond (Surrey).—In the report presented by the Water Committee at the last meeting of the Richmond Town Council, it was stated that the Local Government Board had sanctioned the borrowing of a loan of £10,600 for purposes of water supply, exclusive of an outstanding debt on two boilers and a pump to be superseded by the new machinery, amounting to £336. The loan comprises £1764 for machinery, repayable in 15 years, and £8500 for adits, new mains, &c., repayable in 30 years. The report also stated that the Accountant had submitted a statement, showing that the amount expended and paid by the Chairman of the Committee (Mr. Watney) on account of work done at the wells in adit driving from July 25, 1895, to Oct. 13 last—the date of the Local Government Board inquiry—was £1339 17s. 4d. The cost of adit driving since that date to Dec. 9—the date of the sanction of the loan—was £206 7s. The Committee recommended that the payment of the amount of expenditure by the Chairman be accepted with grateful thanks, and that the expenditure of £206 7s. be charged to the new loan account. The report was adopted; and the generosity of Mr. Watney was heartily acknowledged.

* After deducting 7 per cent. from 186½ million gallons for slip.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

I have almost nothing to communicate in reference to the Edinburgh appointment. The Commissioners meet on Monday—that is the day before this issue—but, so far as I can learn, they will not have the subject before them. The Committee have not yet selected the short leet they wish to place before the Commission. As I said last week, I was informed—and I have been told again to-day—that the matter is already settled. The choice is said to fall on a Scotchman; but from the source of the information, and the notorious fact that the "father" of this story, a Commissioner, is himself a very much disappointed man—and a disappointed man on account of his own tendency to take an independent course at the last moment, which has had the effect of creating distrust in himself—I am very much disposed to throw the statement overboard. Meantime, frantic efforts are being made to bring influence to bear upon Commissioners, by hook or by crook; and the most noted wire-pullers in the city have been enlisted in the cause of this one or that one. I learned only the day before yesterday that a most urgent request had come from a pressman in Manchester to a pressman in Edinburgh—a man whose say in the matter is as little, under any circumstances, as that of the man in the moon—to use his utmost influence on behalf of a certain applicant from the Midlands of England. That, too, was a work of supererogation, because nothing will result from it; the man appealed to having, to tell the truth, forgotten the name of the candidate on whose behalf his good offices were sought to be enlisted. As for myself, I am doing nothing in the matter. So long as there are from fifty to sixty gentlemen on the list, it is out of the question. When they have been reduced to three or so, I may have something to say as to the one I would prefer. But, indeed, I do not much care to interfere, because the Commissioners are quite able to look after the work themselves; and I have little doubt they will (despite all the knocking at their back doors) do the best they can for the gas supply in the district. I met a Commissioner the other night, and put the question to him whether they intended to visit the works of the gentlemen in the final list; and he said he believed that would be done, and that he would be on the deputation. His reason for saying this was that the Gas Commissioners only pay the expenses of deputations, instead of, as the Corporation do, allowing a set sum per day; and, as there would be nothing to be made out of the business, the usual rush would not want to go. I look upon this as a low estimate of the public bodies in the city; but the essential fact in the incident is that there is likely to be, before the appointment is made, a visit to the works of the selected ones. Any such visit, it is true, will be entirely unnecessary, because, long before the fastest express train could carry the deputation to the place, the works would be put in the best of condition as regards tidiness; and so far as methods of working are concerned, the deputation would be but poor judges—the judgment upon that should be by the results shown, and not upon a hasty walk round on a short winter's day. A not-to-be-wondered-at feature in the present hurly-burly is the interest which manufacturers are taking in the filling up of the vacancy. They are to be found here, there, and everywhere, promoting the candidature of the particular man whom they expect to get orders from. Not only so, but some have second strings to their bow, because, in the event of so-and-so getting the place, they have such-and-such a one ready to put forward to succeed him—all in the interest of trade for themselves. This is quite natural; but it illustrates, perhaps as forcibly as anything could, the commotion in the working world which is created by a vacancy such as the present.

The Stirling Gaslight Company have, so far as the unaided eye can see, put an end to the negotiations with the Police Commissioners for a transfer. On Wednesday, the shareholders of the Company met to consider the offer of £61,130 by the Commissioners for the Company's undertaking. The Chairman (Mr. J. Johnston) moved that the shareholders authorize the Directors to sell the undertaking to the Commissioners for payment to the shareholders of 6s. 6d. per share for a period of 25 years from and after Whitsunday, 1897; the shares to be redeemed by the Corporation at the expiry of that period, at £8 each; and in the event of this not being agreed to by the Commissioners, they recommend that the Directors be authorized to offer to the Commissioners to adjust with them the terms of a limited reference to the Sheriff of the County (Sheriff Lees) upon the basis of the reports which had been received from the experts employed by both parties. Not knowing what the integrant holdings are, I cannot say whether the proposal to offer the undertaking for annuities of 6s. 6d. per share for 25 years, and for £8 thereafter, was a fair one or not. The only way I can work it out is this: 6s. 6d. a year for 25 years amounts in the total to £8 2s. 6d.; therefore the proposal was virtually for 50 years' purchase, or, roughly speaking, £400 per share. I do not know the number of shares; but there are, as will appear afterwards, at least 1300. This number, multiplied by 400, brings out a sum of £520,000, which the town would, at the end of 50 years, have paid for the gas undertaking. It is interesting to note the difference between this and Mr. M'Gilchrist's recommendation to pay £61,130 down. The Corporation should have been able, in that event, to borrow the amount at 4 per cent. Four per cent. upon £61,130 is about £2444 a year, or in 50 years, £122,200; and if (it is a rough calculation) the original £61,130 had been redeemed by the end of 50 years, and this sum were added to the amount paid in interest, the total would only amount to £183,330. The proposal of the Chairman of the Company, thus tested, would appear to have been a bold one, and one not likely to ever be accepted. As to the proposal to make a limited reference to Sheriff Lees, it was absurd. There is no authority for such a proceeding; and if a reference were to be made at all, it had better be to a legally appointed arbiter at once, whose decision would have the force of law. At the meeting, it was moved that the offer of the Corporation be accepted; and it was also moved that the Police Commissioners be informed that the Company would be willing to consider an amended offer by the Corporation on the basis of Mr. A. Gillespie's report. The Chairman's motion was adopted by a majority of about 1300 shares; and it was resolved to communicate the finding to the Police Commissioners. The resolution arrived at is

plainly an indication that the Company do not wish to sell their undertaking. I understand it has sent a thrill of astonishment into the ranks of those who have been agitating the community against the acceptance of the offer of the Police Commissioners. In the view of the objectors, the Gas Company were eager to sell to the Corporation at almost any price; but now it happens that the Company consider their undertaking is worth many times the sum offered. Not a few of those who in the post-card vote opposed the transfer, will now see their folly. Had they supported the Police Commissioners, a sale might have been effected, to the benefit of the town. Now, having discouraged the Commissioners, the Company have been emboldened to raise their terms; and, as I said last week, there is no possibility of the Corporation ever having the same favourable opportunity again for acquiring the gas undertaking. The figures I gave last week as the result of the post-card vote were not final it appears. The votes were only counted on Monday; and the numbers were: "No," 2168; "Yes," 146; spoiled cards, 10; and returned by the post office, 60. The result was, however, practically given last week.

At a meeting of the Stirling Town Council on Tuesday, a strong endeavour was made to get the Council to adopt the report of Professor Kennedy with regard to the proposed installation of electric lighting in the town (to which I referred on the 12th inst.), and to have the work, involving an expenditure of £20,000, carried out at once. There was a little of the insidious in the attempt, for the prime mover could not quite satisfactorily make it clear that the adoption of the report and the resolution to proceed committed the Corporation to the whole scheme; and the Corporation showed good sense in adopting the report generally, and sending the subject back to the Committee to consider and report as to how far the work should be carried out at present. The community have decided against spending £60,000 upon gas-works, from which the whole town is lighted; and yet the Town Council are fluttering round a proposal to lay out £20,000 upon the electric lighting of three streets. Verily, in Stirling there is such a thing as "straining at a gnat and swallowing a camel."

The difficulty which was attempted to be created between the Corporation of Dunfermline and the Dunfermline Gas Company, regarding the £5000 out of which the Company paid their dividend for the year ending May 31 last, having, as I stated last week, been satisfactorily arranged, the Directors of the Gas Company have begun to insist that the Corporation shall take over the undertaking without further delay, otherwise they will be under the necessity of applying for the appointment of a judicial factor to manage the works. Happily, there will be no necessity for proceeding to this extreme, for it has been arranged, after conference between the Directors and the Corporation Committee, that the price will be paid on the 29th inst. The situation is this: The Corporation are waiting to see if money will get cheaper before they borrow; and the Directors of the Company are, naturally, anxious to have the money in their hands so long as the Bank rate is higher than it was some time ago. There is thus a conflicting interest. The Corporation Committee are endeavouring to obtain a temporary loan, and intend to float a Corporation financial scheme afterwards, under which the citizens will have an opportunity of investing their savings in the gas undertaking.

The report which the Directors of the Coatbridge Gas Company will submit to the shareholders next Tuesday states that the consumption of gas increased by 5,221,000 cubic feet in the six months ending the 31st ult., as compared with the corresponding period of 1895. The total revenue was £7689; and the profits are £2855. The amount available for division is £2703; and dividends at the rates of 10 and 7 per cent. per annum will be recommended. The number of consumers was augmented by 392 in the past half year. The works and plant, which are under the supervision of Mr. T. Wilson, have been maintained in a perfect state of efficiency; special attention having been given to the purifiers, which have been enlarged at a cost of £2343, in order to meet the increased demand for gas.

Mr. D. M. Stevenson, of the Glasgow Town Council, is dissatisfied with the present arrangement whereby the Gas Committee manage the electric lighting department; and he has given notice of motion to the effect that, after the expiry of the current financial year, the administration of the electric lighting department of the Corporation, so far as works are concerned, should be under the control of a separate General Committee, instead of being, as at present, managed by the Sub-Committee having control of the gas-works.

The action by James M'Kelvie and Co., of Edinburgh, against the Arniston Coal Company, which has been before Lord Low at intervals since October, has now reached the final stage. The discussion upon the evidence was closed yesterday afternoon; and his Lordship took time to consider his judgment, which may be expected in, perhaps, about a fortnight. The matter is still creating great interest in coal circles, where the meaning of the action is well understood. On every occasion on which the case has been up, there has been a contingent of west country coal dealers watching the proceedings.

In Greenock an experiment has been made in public street lighting by incandescent gas-lamps. Six of them have been in use in Cathcart Street; and they have given very great satisfaction. Other lamps are to be erected in some of the darker streets in the town; and the experiment is to be continued for six months.

In the Rothesay Town Council, an attempt was made last week to rescind a resolution adopted in September, 1884, under which the profits on the gas undertaking are appropriated to the burgh proper account. The movement was in the right direction; but when a wrong step is once taken, it is often difficult to return. The Town Council found this to be the case; and they resolved to continue the practice which was adopted in 1884.

The knotty question with reference to the public lighting of rural areas—villages and otherwise—which arose at Newcastleton, in Roxburghshire, and to which I referred in my "Notes" on Nov. 3 last, has been settled in the First Division of the Court of Session. The question was whether the Burgh Police Act of 1892 providing that such lighting should be by "gas or other improved light," it was competent to light the area by means of oil-lamps. The objectors desired to prevent the public lighting being carried out under the statute, which, by prohibiting oil, they would have been able to do, as both gas and electricity are out of the question in such a sparsely populated district. Their Lordships of the Court of Session held that oil might be made an improved light; and that it was in the discretion of the Lighting Committee to use oil if they were satisfied that it gave a satisfactory result. This, it may be expected, will give a fillip to oil lighting for such places. The decision will also be the mainstay of any who may, in more populous places than Newcastleton, seek to have the public lighting effected by means of oil; and thus, in a new sense, it is probable that oil will come to be the heaviest competitor which gas has to face. In places where the price of gas is over 6s. per 1000 cubic feet, I suppose it is indubitable that oil lighting would be cheaper; and now that there is legal authority, it is too much to expect that it will not be used. The lesson for gas companies is to make haste to adjust their works and capital so that they may be able to reduce the price of gas, and thus be in a position to hold the field.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 23.

Sulphate of Ammonia.—During the week, prices have been somewhat irregular; but a fair amount of business has been done. A week ago dealers were directing their attention to depressing the market; and to a certain extent they succeeded—consumers orders being scarce at the advanced price reached. But at the close, the tone is rather firmer; and the quotations are £7 17s. 6d. Leith, £7 17s. 6d. Hull, and £7 18s. 9d. to £8 f.o.b. Liverpool. Efforts are still being made by speculators to depress spot prices by offering February at the same level, and even at a discount, from which it would appear that there is still covering of January contracts to be done. In the forward position, "bears" are again showing themselves. Their quotations abroad over spring months are at a premium of barely 5s. per ton upon January value; and they have encouragement in the course they are taking. They do not forget the stocks left over from last year. London makers have been offering May-August delivery at £8 per ton, Beckton terms. The speculative interest is not all "bear," however; and, given more favourable weather, the "bulls" are pretty certain to make their influence felt—probably in any case. Consumers are watching events closely; and they have been picking up any parcels offered at tempting prices, but they do not show any great eagerness to buy unless over spring months at about spot prices.

Nitrate of Soda has been quiet in all positions—no doubt mainly owing to the severe weather preventing transit from the ports to the interior, and consequently stopping buying. Quotations for cargoes are unchanged; but in the meantime they must be considered nominal. On spot, the quotation for good quality is 8s. 1½d. per cwt.; while for fine 8s. 3d. per cwt. is asked, with but little demand.

LONDON, *Jan.* 23.

Tar Products.—The recent rapid rise in the value of benzol has somewhat frightened buyers; and, for the moment, it has stopped business. But the admitted scarcity of benzols, and the decreasing production, gives the forward value of these articles a favourable outlook. A capital business is being done in solvent and heavy naphthas. The conspiracy to depress carbolic acid is not likely to succeed, as neither sellers nor buyers have stocks, and the trade in crystals is undoubtedly satisfactory. There is nothing interesting to say about anthracene, the price of which is being maintained by the Committee at a much higher level than the quotations outside of it. Pitch is weaker; and considerable business is reported as having been done in London at about 24s. Country pitch, with its better agglomerating properties, should be worth more money.

Transactions during the week have taken place at the following prices: Tar, 18s. to 25s. Pitch, 23s. 9d. to 24s. 6d. Benzols, 90's, 3s. 6d.; 50's, 2s. 11d. Solvent naphtha, 1s. 8d. Crude, 30 per cent., naphtha, 1s. 2d. Creosote, 1¾d.; liquid, 2¾d. Heavy oils, 35s. to 40s. Naphthalene, 65s.; salts, 30s. Carbolic acid, 60's, 2s. Anthracene, nominal, "A," 8½d. to 10½d.; "B," 7d. to 8d.

Sulphate of Ammonia.—There is a pause in the advancing prices of this article; and some dealers are leaving the market severely alone. There is no reason for a reduction in price; and makers would be unwise to lend themselves to the operations of speculators, who desire to cover at lower rates. Business during the week has been done at £8 London, £7 18s. 9d. Liverpool, £7 17s. 6d. Leith, £7 15s. Hull—all less 3½ per cent. For forward delivery, 5s. per ton more is obtainable.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Business in the coal trade here has been only moderate during the past week; but prices generally are without alteration, and pits as a rule are kept running full time with orders in hand. Steam and forge coals meet with a steady demand, at full late rates. At the pit mouth, round-coal prices remain at about 10s. 6d. to 11s. per ton for best Wigan Arley; 8s. 6d. to 9s. for Pemberton four-feet and seconds Arley; and 6s. 6d. for steam and forge coal. Supplies of engine fuel are rather more plentiful; and for immediate delivery, surplus lots are pushed for sale at under full current rates. But for anything like forward delivery, colliery representatives hold firmly to late quotations, averaging from 3s. to 3s. 6d. per ton for common slack; 3s. 9d. to 4s. 3d., for medium; and 4s. 6d. to 5s., for best sorts. The shipping trade is fairly active, with good steam coal fetching 7s. 9d. to 8s. per ton delivered at the Mersey ports, and about 8s. to 8s. 3d. delivered at the High Level, Liverpool.

Northern Coal Trade.—The stormy weather has in several ways deranged the coal trade. It has increased the demand both for gas and household coals; but it has also prevented the arrival of steamers, and thus limited the shipments of coals from most of the north-country ports. Best Northumbrian steam coals have been in demand; and prices were firm at from 7s. 9d. to 8s. per ton f.o.b., for immediate and early shipment. But for shipment over the spring and summer season, the general quotation is as high as 9s. per ton. Second-class steam coals are 7s. 3d. to 7s. 6d. per ton f.o.b.; and steam smalls are dull in price, and very plentiful, at 3s. per ton. Manufacturing coals are in

steady demand, without any alteration of moment in the prices. In regard to gas coals, the demand has been stimulated by the cold and dark weather; and there has been a large production, which has been very fully taken up. There is now some little negotiation as to the price of gas coals for long contracts; but little or none has yet been actually sold.

Scotch Coal Trade.—Trade is firm, with no change in values. Main coal is moving off freely, and so is splint. There is a large output; but the demand seems equal to it all, there being a large shipping trade. A new development of the miners' agitation took place last week, at a conference of delegates which was held in Glasgow. It was resolved to take the opinion of the miners on the policy to be pursued; and further that unorganized as well as organized miners should be invited to send delegates to the conference to be held after the miners have given their instructions. All the districts are moving for an advance. The reply of the masters to the movement is that shipping prices have not advanced; and that, of inland orders, so many are under contract that the rise which has been experienced is inappreciable. The prices quoted are: Main, 6s. 9d. per ton f.o.b. Glasgow; ell, 7s. to 7s. 3d.; splint, 7s. 6d. The shipments for the week amounted to 122,742 tons—an increase of 34,795 tons over the preceding week, but a decrease of 1475 tons when compared with the corresponding week of last year. For the year to date, the total shipments have amounted to 260,678 tons—a decrease of 6238 tons on the same period of last year.

Penzance Water Supply.—The question of the water supply was again under discussion at a meeting of the Penzance Town Council last Wednesday week. At a previous meeting, Alderman Caldwell expressed dissatisfaction with the suggestion that consideration of a larger scheme might be postponed until the effect of the work for improving the present supply is seen. He now moved a resolution instructing the Sanitary Committee to bring up for consideration within two months any scheme or schemes which will, in their opinion, best attain the object of giving the town a constant supply of water. Some discussion ensued, in the course of which it was suggested that an expert should be called in as a preliminary step. It was not adopted, however; and the time named having been extended to four months, the resolution was carried.

Windsor and Eton Water Supply.—The Borough Treasurer of Windsor (Mr. W. Beach) has prepared an abstract of the accounts of the borough for the past year. We learn therefrom that the capital which the Corporation are entitled to raise on their water undertaking is £194,750, of which £165,000 has been borrowed, and all spent except £1725. The revenue account shows a net profit of £4968 6s. 9d., as compared with £4471 7s. 8d. in 1894-5. Last year's profit was disposed of in paying £4758 for interest on debenture stock at 3 per cent., £164 6s. 8d. for income-tax, £81 5s. 1d. composition for duty, and £3 15s. interest—together, £5007 6s. 9d., or just £39 more than the profits. The works are practically self-supporting; and the sum of £100 is taken from the borough funds to be added to a sinking fund for the redemption of the debenture bonds.

Progress of the St. Mary Church Gas Supply.—At the last meeting of the St. Mary Church District Council, it was stated that considerable increase—equal to a revenue of £500 per annum—had taken place in the course of the past few years in the consumption of gas. In view of this gratifying condition of affairs, it was decided to raise the salary of the Gas Manager (Mr. T. Evans) by £20 a year. Mr. Evans, in expressing his thanks for this recognition of his services, said he hoped shortly to be in a position to recommend the Council to reduce the price of gas.

Annual Dinner of Employees of The Gaslight and Coke Company.—The annual winter dinner of the fitters and service layers connected with the Central (Goswell Road) Division of The Gaslight and Coke Company was held last Wednesday, at the Horseshoe Hotel, Tottenham Court Road. Mr. W. C. Wigley presided, and was supported by Mr. G. F. L. Foulger, the Chief Engineer of the Distribution Department of the Company; while the vice-chair was filled by Mr. T. Taylor. Over 100 persons, including several guests, sat down to dinner. The toast of the evening, "The Gaslight and Coke Company," was proposed by the Chairman, and responded to by Mr. Foulger, who declared that the workmen were the backbone of the Company. He also remarked that, notwithstanding the electric light, the consumption of gas during the past year had increased by upwards of 9 per cent. The toast was received with much enthusiasm. The arrangements were excellently carried out by the Stewards, Messrs. C. Tully and G. Pepper, and the Hon. Secretary, Mr. S. Hunneybell, who provided an enjoyable programme of music, in which Messrs. Wyatt, Excell, Shadwell, Futcher, Gifford, Howell, and Cullen took part.

Local Authorities and the London Water Question.—The Kensington Vestry, on the recommendation of their Parliamentary Committee, will petition against the London Water-Works Purchase Bills. The Committee have all along taken exception to the promotion of legislation by the Council for the acquisition of the undertakings of the Water Companies. The Vestry have also supported this view in resolutions which they have from time to time passed, in favour of legislation which should have the effect of granting control and supervision over the water supply to a body representing the ratepayers, as distinct from the purchase of the several undertakings. The Committee feel that the question is one which must be dealt with by a Government measure; and that the Council are not justified in continuing to impose upon the ratepayers a fruitless expenditure in vain attempts at promoting legislation upon the question. The Water Committee of the Essex County Council have resolved—"That, the President of the Local Government Board having asked for a formal statement of the views of the Essex County Council as to proposed legislation in the matter of the Metropolitan Water Supply, the Council be recommended to reply that, if the Metropolitan water area within the county can be assured of acquiring an adequate proportion of the sources of supply now used by the East London Water Company within such area, a separate water authority be formed for that area, combined, if possible, with the County Borough of West Ham. Otherwise they would prefer representation on a general Metropolitan Water Trust."

GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 176).

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	15 Oct.	10½	Alliance & Dublin 10 p. c.	23—25	..	4 4 0
100,000	10	,,	7½	Do. 7 p. c.	17½—18½	..	4 1 1
300,000	100	2 Jan.	5	Australian (Sydney) 5% Deb.	108—111	+1	4 10 11
200,000	10	29 Oct.	5	Belgrano (B. Ayres), Limited	10—10½	..	4 15 3
100,000	Stck.	30 Dec.	5	Do. 5 p. c. Deb. Stk	102—105	..	4 15 3
200,000	5	12 Nov.	6½	Bombay, Limited	6½—7½	−1	4 6 8
40,000	5	,,	6½	Do. New, £4 paid	4½—5½	−1	4 14 6
380,000	Stck.	13 Aug.	12	Brentford Consolidated	293—295	..	4 1 4
210,000	,,	,,	9	Do. New	225—230	..	3 18 3
50,000	,,	,,	5	Do. 5 p. c. Pref.	140—145	..	3 9 0
159,375	,,	11 Dec.	4	Do. 4 p. c. Deb. Stock.	130—134	..	2 19 9
220,000	Stck.	16 Sept.	11½	Brighton & Hove Original	270—275	..	4 3 7
208,820	,,	,,	8½	Do. A Ord. Stk.	187—192	+2	4 8 7
933,500	Stck.	28 Aug.	5	Bristol, 5 p.c. max.	127—132	..	3 15 9
420,000	20	15 Oct.	11½	British	56—57	..	3 18 11
50,000	10	28 Aug.	11½	Bromley, Ordinary 10 p. c.	24—26	+3	4 8 6
71,000	10	,,	8½	Do. 7 p. c.	19—21	+1	4 0 11
500,000	10	15 Oct.	6	Buenos Ayres (New) Limited	10½—10¾	..	5 11 8
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	101—103	..	5 16 6
150,000	20	15 July	8½	Cagliari, Limited	29—31	..	5 6 5
100,000	10	30 Sept.	6	Cape Town & District, Ltd.	15¾—16½	−⅛	3 12 9
50,000	50	3 Nov.	6	Do. 6 p. c. 1st Mort.	57—59	..	5 1 8
550,000	Stck.	15 Oct.	13½	Commercial Old Stock	338—343	..	3 18 8
165,000	,,	,,	10½	Do. New do.	255—260	..	4 0 9
165,000	,,	11 Dec.	4½	Do. 4½ p. c. Deb. do.	150—155	..	2 18 0
800,000	Stck.	30 Dec.	13	Continental Union, Limited.	260—265	..	4 18 1
200,000	,,	,,	10	Do. 7 p. c. Pref.	215—220	..	4 10 11
51,600	Stck.	28 Aug.	14	Croydon Com'cial A 10 p. c.	315—320	..	4 7 6
163,400	,,	,,	11	Do. B 7 p. c.	250—255	..	4 6 3
535,000	Stck.	28 Aug.	5½	Crystal Palace Ord. 5 p.c. Stk	140—143	..	3 13 5
60,000	,,	,,	5	Do. 5 p. c. Pref.	140—145	..	3 9 0
486,090	10	15 July	11	European, Limited	25½—26½	..	4 3 0
334,050	10	,,	11	Do. £7 10s. paid	18—19	..	4 6 11
5,746,590	Stck.	13 Aug	12¾	Gaslight & Coke, A, Ordinary	318—323	+3	3 19 0
100,000	,,	,,	4	Do. B, 4 p. c. max.	110—115	..	3 9 7
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	305—315	..	3 3 6
30 000	,,	,,	5	Do. F, 5 p. c. Prf.	140—145	..	3 5 9
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	212—217	..	3 9 1
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	207—212	..	3 6 0
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	305—315	..	3 3 6
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	175—180	..	3 6 8
1,061,150	,,	11 Dec	4	Do. 4 p. c. Deb. Stk.	137—142	..	2 16 4
294,850	,,	,,	4½	Do. 4½ p. c. do.	150—155	..	2 18 0
908,000	,,	,,	6	Do. 6 p. c. do.	203—208	..	2 17 7
70,000	10	29 Oct.	6	Hongkong & China, Limited	12—13	..	4 12 4

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
3,800,000	Stck.	12 Nov.	12	Imperial Continental	220—225	+2	5 6 8
376,400	100	1 Aug.	4	Do. 4 p. c. Debs. Red.	100—103	..	3 17 8
473,600	Stck.	13 Aug.	3½	Do. 3½ p. c. Deb. Stk	105—108	..	3 4 10
75,000	5	11 Dec.	6	Malta & Mediterranean, Ltd.	6—6½	..	4 12 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	111—115	..	4 6 11
250,000	100	,,	4½	Do. 4½ p. c. Debs.	109—111	..	4 1 1
541,920	20	12 Nov.	5	Monte Video, Limited	15½—16½	−½	6 1 3
150,000	5	26 Nov.	8	Oriental, Limited	8½—9	..	4 8 11
135,000	5	,,	8	Do. New, £4 10s. paid	7½—8	..	4 10 0
15,000	5	,,	8	Do. do. 1879, £1 paid	1¾—2	..	4 0 0
60,000	5	16 Sept.	7	Ottoman, Limited	5—5½	..	6 7 3
420,000	100	2 Nov.	6	People's Gas } 1st Mtg. Bds.	100—105	−1	5 14 3
500,000	100	1 Dec.	6	of Chicago } 2nd Do.	100—105	..	5 14 3
250,000	10	30 Sept.	10	San Paulo, Limited	12½—13½	−½	7 8 2
5,475,000	Stck.	13 Aug.	5⅛	South Metrop., 4 p.c. Ord.	145—149	..	3 9 9
820,000	,,	15 July	5	Do. 5 p. c. Deb. Stk.	163—172	..	2 18 2
60,000	Stck.	16 Sept.	11½	Tottenham & Edmonton, A	280—290	..	3 19 4
60,000	,,	,,	8½	Do. B	190—200	..	4 5 0
170,380	10	30 Dec.	10	Tuscan, Limited.	14—15	..	6 13 4
149,900	10	2 Jan.	5	Do. 5 p. c. Debs. Red.	100—102	..	4 18 0
				WATER COMPANIES.			
746,159	Stck.	30 Dec.	10½	Chelsea, Ordinary	333—338	..	3 2 2
150,000	,,	,,	5	Do. 5 p. c. Pref.	175—180	..	2 15 6
160,000	,,	,,	4½	Do. 4½ p. c. Pref. Stk., 1875	158—162	..	2 15 6
175,783	,,	30 Sept.	4½	Do. 4½ p. c. Deb. Stock	162—167	..	2 13 11
1,719,514	Stck.	15 Oct.	7	East London, Ordinary	230—235	+2	2 19 7
654,740	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	162—167	..	2 13 11
225,000	,,	,,	3	Do. 3 p. c. Deb. Stk.	105—107	..	2 16 1
700,000	50	11 Dec.	7½	Grand Junction, 10 p.c. max.	115—120	..	3 2 6
295,080	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk.	150—155	..	2 11 7
708,000	Stck.	13 Aug.	12	Kent	340—345	..	3 9 7
160,000	,,	,,	7	Do. New, 7 p. c. max.	215—220	..	3 3 7
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	270—275	..	3 9 1
406,200	100	,,	7½	Do. 7½ p. c. max.	222—227	..	3 6 1
350,000	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk.	150—153	..	2 12 3
500,000	100	13 Aug.	12 5/16	New River, New Shares	420—425	..	3 0 8
1,000,000	Stck.	30 July	4	Do. 4 p. c. Deb. Stk.	153—156	..	2 11 3
902,300	Stck.	30 Dec.	6	S'thwk & V'xhall, Ordinary	153—158	..	3 15 11
126,500	100	,,	6	Do. Do. 7½ p. c. Max.	149—154	..	3 17 11
489,200	Stck.	,,	5	Do. Do. 5 p. c. Pref.	175—180	..	2 15 7
1,019,585	,,	30 Sept.	4	Do. 4 p. c. A Deb. Stk.	148—151	..	2 13 0
1,155,066	Stck.	11 Dec.	10	West Middlesex	310—315	..	3 3 6
200,000	,,	,,	4½	Do. 4½ p. c. Deb. Stk.	163—168	..	2 13 7

*Ex div.

Proposed Extension of the Burnley Corporation Gas and Water Works.—The Burnley Corporation having applied to the Local Government Board for a Provisional Order to cover borrowing powers for £100,000, part of which is required for an extension of the gas and water works, an inquiry was recently held in the Town Hall by Major-General Crozier. The Town Clerk (Mr. W. T. Fullalove), in explaining the needs of the Corporation, said that with the growth of the borough it was found necessary to increase their water supply; and a sum of £25,000 had been put down for an extension of the reservoirs, and £5000 for new mains. A sum of £25,000 was also required for the gas undertaking; this amount including the erection of new holders and the purchase of meters. A new retort-house, to cost £9000, will likewise be required shortly. There was no opposition.

The Southampton Corporation and the South Hants Water-Works.—There are indications of united resistance on the part of the districts supplied by the South Hants Water Company against the Bill of the Southampton Corporation, by which they seek power to take over the concern. At a recent public meeting at Hornsey, the ratepayers present unanimously expressed their wish that the Bill should be opposed; and last Thursday the Town Council considered the matter. It was pointed out by the Mayor (Alderman J. Tuck) that the Company had proved themselves capable of carrying on their own business in the past; but he had an idea that the main object of the action of the Southampton Corporation was that they might give to Millbrook and Freemantle that which they had promised when those districts were annexed to the borough. With the exception of two members who were neutral, the Council were in favour of opposing the Bill. It is understood that the Directors of the Company have declined to meet a Sub-Committee appointed by the Southampton Corporation for the purpose of conferring with them.

Mr. J. M'Gilchrist on Coal Gas and Its Inventor.—Last Thursday, Mr. J. M'Gilchrist, the Engineer and Manager to the Dumbarton Corporation gas-works, delivered a lecture on "William Murdoch, the Inventor of Gas Lighting: His Life and Work," under the auspices of the Dumbarton Mechanics' Institute. Mr. M'Gilchrist traced the history of Murdoch, and proceeded to say that the increase in the consumption of gas last year over the previous twelve months was equal to 6 per cent., which showed that the gas industry was by no means falling behind. By experiments he showed how the illuminating power of gas might be destroyed in its consumption. Gas, he said, was sold in Dumbarton at something like 1d. per pound; and by way of showing what this 1d. worth of gas would do, he exhibited a well-cooked dinner cooked in a Main gas-stove with this amount of gas. With regard to incandescent gas lighting, he showed how in this system the coal gas was used as a heating rather than as a lighting agent. He explained the manufacture of the mantles, and dwelt upon the great saving in gas caused by producing light by raising them to incandescence. "Holophane" globes he also exhibited, and stated that they were the only globes at the present time which did not reduce the illuminating power of the gas. At the close of the lecture, a cordial vote of thanks was accorded to Mr. M'Gilchrist.

The Chichester Corporation and the Water-Works.—The question of carrying out some important improvements at the water-works was dealt with in a report signed jointly by Mr. W. Shelford and Mr. James Mansergh, and presented at a meeting of the Chichester Town Council last Friday. They recommended that, having regard to the application from Selsey to be included in the area of supply, a new well be sunk at the pumping-station, and the engine and boiler house be considerably enlarged, at a cost of £5000. After some discussion, a resolution authorizing the Water Company to do the work at the cost estimated was passed by the casting vote of the Mayor.

Opposition to the Weymouth Gas and Water Bills.—On Monday evening last week, a public meeting was held in the Guildhall, Weymouth, for the purpose of passing resolutions of owners and ratepayers of the borough sanctioning opposition by the District Council to the Bills promoted by the Weymouth Gas and Water Companies, for the purpose of extending their limits of supply and other purposes. The meeting, which was a large and representative one, was convened in compliance with a requisition to the Mayor (Mr. C. Jesty, J.P.), who presided. The Town Clerk (Sir R. N. Howard), in two effective speeches, set forth the expediency of the Companies' applications being opposed; and the resolutions sanctioning this course, and the payment of the expenses out of the general district rate, were carried unanimously—no amendment being submitted in either case. Commenting on the matter, a local paper notes with pleasure that "there was no disposition on the part of the meeting to overlook the undoubted advantages which the Gas and Water Companies have conferred on the town." But it goes on to say: "We must be just as well as generous; and every public consideration demands that not only should the town oppose the extension applied for, but should do its utmost to acquire by legitimate and equitable process both the undertakings."

The Basis of Charge for Water in the Stockport Water Company's District.—A question as to the correctness of the rates charged by the Stockport Water Company was raised by Mr. Barton at the meeting of the Heaton Norris District Council last Thursday. He held that the Company had no right to charge the consumers on their gross rental, but only on the assessment; and he thought the time was now opportune when the Council, in conjunction with other neighbouring authorities, should take some joint action in the matter. The point, he said, had been decided over and over again in different parts of England, and recently in Manchester. The Town Clerk of Salford (Mr. S. Brown) had refused to pay the water-rate unless it were charged upon the assessment, and not on the gross rental. In one instance in the district, the Company had agreed to charge only on the assessment; and he submitted that if the Company did this in one case under pressure, they should do so all round. He therefore moved—"That the Clerk write to the Stockport Water-Works Company asking for their authority for charging water-rents on gross rental instead of the net poor-law assessment as in other districts." The Clerk said the Act of Parliament under which the Company worked stated that the rate should be assessed on the "annual value." The resolution was unanimously adopted.

RICHMOND & CO., Ltd.,

WARRINGTON & LONDON.

The "ORIENT"

33½ H. by 21 W. by 17½ D.

553	. . . . .	37s. 6d.
1553	With Cathedral Door.	42s.
2553	Ditto Condensing	55s.

A CHARMING STOVE.

Polished **Copper Reflector and Pillars.**

Ruby Glass in front.

Cathedral Glass Door Extra.

Condensing or Non-condensing.

ONLY FITTED FOR FLUE WHEN ORDERED.

Non-condensing (Nos. **553** & **1553**) **recommended.**

Ashton-in-Makerfield Gas Supply.—Mr. James Hill, the Manager of the Ashton-in-Makerfield Gas-Works, has reported to his Committee that the total make of gas last year was 15,255,000 cubic feet—an increase on the previous year's output of 914,000 cubic feet. At the end of December, 60 prepayment meters had been fixed.

The Capital of the East Surrey Water Company.—At a recent extraordinary general meeting of the East Surrey Water Company—Sir Frederick Bramwell presiding—it was resolved to authorize the raising of additional capital by the creation and issue of ordinary shares; and also to consolidate the whole of the debenture stocks to bear interest at the rate of 4 per cent. per annum.

Additional Works for the South Staffordshire Water Company.—The construction of a large reservoir and other works at Springsmire, Dudley, for the South Staffordshire Water Company, has been commenced. The dimensions of the reservoir will be 200 feet by 150 feet, with a depth of 17 feet; the capacity being 3,250,000 gallons. It is being constructed for the purpose of dealing with the water supplied from the Company's pumping-station at Kingswinford, and for distributing it to Cradley Heath, Quarry Bank, Pensnett, Kingswinford, Brierley Hill, Hart's Hill, and Round Oak. The estimated cost of the work is stated to be nearly £14,000.

Incandescent Gas Lighting at Chippenham.—The Lighting Committee of the Chippenham Town Council have reported the result of their experiment with incandescent gas lighting. They think the Council might consider the advisability of gradually introducing the system. The price of the gas-burners for the ordinary lanterns is 14s.; but the Gas Company are prepared to make special terms with large purchasers. Not taking into consideration the increased brilliancy of the light, the cost of maintenance compares as follows with the ordinary gas-jets: Welsbach burner, 1000 hours, with gas at 3s. 9d. per 1000, 15s. 6d.; mantle, 1s. 3d.—total, 16s. 9d. Ordinary burner, 1000 hours, 18s. 9d.

The Recent Dismissal of Gas Workers at Leeds.—Last Tuesday, Mr. Lowden and Alderman Walker (the Chairman and Deputy-Chairman of the Leeds Corporation Gas Committee) had an interview with a deputation of the workmen and Messrs. Smith and Wood, the local officials of the Gas Workers' Union, with reference to the dispute which recently arose in connection with the dismissal of certain men in the pipe-laying department. It may be recollected that at first the Committee decided to discharge a superintendent, two foremen, and four labourers; but after hearing an explanation from the men, they agreed to retain the services of the latter. It is understood that, as a result of the further interview on Tuesday, the matter is practically settled. Mr. Smith states that the Committee have exonerated all the men concerned from any blame, with the exception of one, against whom an allegation of bad workmanship has been preferred, which still remains to be investigated.

The Newcastle Corporation and the Tynemouth Corporation Water Bill.—The Bill which is being promoted by the Tynemouth Corporation to empower them to supply their own district with water has been under the consideration of the Gas and Water Committee of the Newcastle Corporation, with the result that they have decided to petition against two clauses which, it is considered, would be injurious to the Newcastle people, unless the matter is settled by some amicable arrangement. The first clause has reference to obtaining a supply of water for storage purposes from the Newcastle and Gateshead Water Company. The Committee object to any water for storage purposes being supplied during summer months, and contend that it should only be given during winter, after it is ascertained that there is sufficient water in store for the use of the residents in Newcastle and Gateshead. The second clause to which objection is taken is one in which the Tynemouth Corporation seek powers, not only to supply water for their own immediate district, but also in outlying areas.

Mid-Sussex Water Company.—The Directors of this Company, of which Mr. H. J. Robus is the Chairman, report that the profit for the six months ending Dec. 31 shows a considerable increase over the corresponding period of 1895. After payment of interest upon all charges, there is a balance of £9 2s. 6d. This is carried forward. For the first time in the history of the Company, the profit for the half year exceeds the amount required to pay all interests.

The Duke of Norfolk and the Water Supply of Littlehampton and Arundel.—The question of improving the water supply of Littlehampton has been under consideration for some time; and a solution of what has proved a difficult question is, it seems, now forthcoming. A reservoir is to be built at Crossbush, near Arundel, from whence the water will flow by gravitation to Littlehampton; and, if considered necessary, Wick can be supplied *en route*. Once again the generosity of the Duke of Norfolk is shown. His Grace not long since gave to Arundel a supply of pure water, which supply also reaches Crossbush; and communications between his Grace and the Littlehampton District Council have resulted in the present scheme being propounded.

Progress of Gas Supply at Dover.—Some particulars have lately appeared in a Dover paper in regard to the progress of the gas supply in that town in the six years ending December, 1895, as shown by the Board of Trade returns. In 1890, the make of gas was 175,593,000 cubic feet, which was employed in the supp'y of 2298 consumers and 755 public lights; the revenue produced being £31,137. In 1895, the make was 193,719,000 cubic feet, there were 2443 consumers, and 804 public lights; and the revenue was £31,861. In 1890, the expenditure was £26,941; the quantity of coal carbonized being 15,658 tons. In 1895, it was £26,395; and 17,590 tons of coal were carbonized. During the past six years, the Company have reduced the price of gas twice. At the beginning, the charge to private consumers was 3s. 3d. per 1000 cubic feet, with a discount of 3d. This was continued in 1891 and 1892. In 1893, the price was 3s. gross, and 2s. 9d. net; and in 1894 and 1895, 2s. 9d. gross, and 2s. 6d. net—the lowest price, except at Maidstone, in Kent.

The Southampton Gas Company are offering for tender £5000 of 5 per cent. debenture stock at a minimum price of £155 per cent.

Messrs. R. Dempster and Sons, Limited, of Elland, have secured a contract for new condensers, exhauster, purifiers, and gasholder at the Sedbergh Gas-Works.

The Chelsea Water-Works Company invite tenders for a sufficient amount of 2¾ per cent. debenture stock to realize £50,000. The minimum price of issue is 98. The stock is redeemable after 25 years, subject to six months' notice being given.

Messrs. W. Parkinson and Co. held an exhibition of cooking and heating appliances, and of the latest improvements in gas lighting, &c., in the Wesleyan Schools, Ocker Hill, Tipton, from the 11th to the 15th inst. It was opened by Mr. D. Hipkins, the Chairman of the District Council and of the Gas Committee. Miss A. C. Wilkinson gave practical demonstrations on cookery twice daily.

We have received a copy of "Sell's Directory of Registered Telegraphic Addresses for 1897," published at No. 167, Fleet Street, E.C. The contents of this useful book are compiled from official lists supplied by authority of the Postmaster-General; and therefore accuracy may be relied upon. This is the twelfth year of publication; and the work becomes of increasing utility with the great annual extension of the telegraph and telephone systems. Several new features have been introduced into the present edition, which, in addition to an interesting opening article on "British Trade and Foreign Competition, 1895-6," by Mr. Joseph Ackland, contains special articles and statistics by the same author relating to the iron and steel, coal, petroleum, and other industries.

GWYNNE & BEALE'S
PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 65,095.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

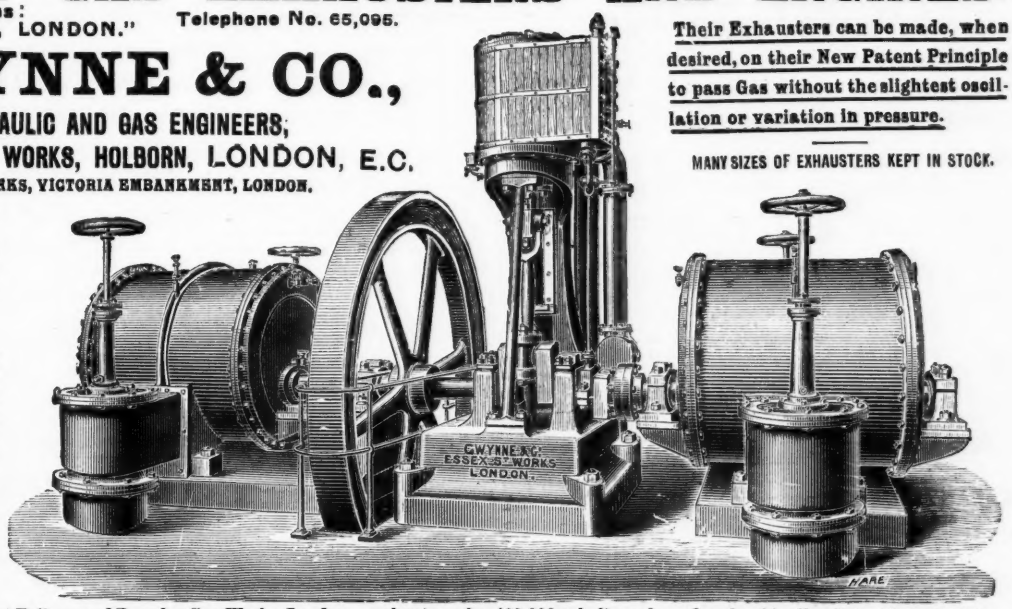
BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.



Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.

Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

Catalogues and Testimonials sent on application.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
JOHN WM. O'NEILL, Managing Director,
Palmerston Buildings, Old Broad Street, London, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to be addressed to Palmerston Buildings.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 800 British Gas-Works.
ANDREW STEPHENSON,
182, GRESHAM HOUSE,
OLD BROAD STREET,
LONDON, E.C.
Telegrams: "Volcanism, London."

AMMONIACAL LIQUOR wanted.
BROTHERTON AND Co., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR wanted.
BROTHERTON AND Co., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE wanted.
BROTHERTON AND Co., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHURIC ACID for Sale.
BROTHERTON AND Co., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

TUBES for Gas, Steam, and Water (all Sizes), Welded or Riveted. TANKS, HYDRAULIC MAINS, RETORT-LIDS, &c.
JOHN SPENCER, Globe Tube Works, WEDNESBURY; and 14, Great St. Thomas Apostle, LONDON.

HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works Sundries. (See p. 106, last week's issue.)
Telegrams: "HUTCHINSON BROS., BARNSLEY."

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

WANTED, by a Young Man, a Situation as INSPECTOR. Able to fix Meters and Stoves, and do general Fitting. South of England preferred.
Apply to the MANAGER, Gas-Works, ROMSEY.

YOUNG Man desires Situation in Gas or Water Office as CLERK or COLLECTOR. Ten Years' general Experience in a large Midland Gas Accountant's Office. Age 25. Good References.
Apply, by letter, to No. 2778, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GENTLEMAN, with knowledge of DRAWING and Experience in TRAVELLING and general routine of Gas Engineer's Office, is open to Engagement. Has good connection with Gas Companies, and no objection to go abroad.
Address No. 2786, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

DRAUGHTSMAN wanted by the Tynemouth Gas Company. One having a knowledge of Gas Engineering preferred. Salary £2 per week.
Applications to the undersigned, stating Age and Experience.
W. HARDIE, jun.
Gas-Works, North Shields.

GIBRALTAR GAS COMPANY.

WANTED, a Man competent to Repair and TEST GAS-METERS, and experienced in Gas-Fitting and Fixing of Stoves and Meters. Age not to exceed 35 years. Abstainer preferred.
Wages $15 per week (equal to £2 10s. Sterling) of fifty hours. Passage Out and Home, and Contract for Three Years.
Address, stating Age and Qualifications, with References, the GIBRALTAR GAS COMPANY, GIBRALTAR.

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER LINCOLN."
[For Illustrated Advertisement see Jan. 5, p. 48.]

SADLER & Co., Ld., Middlesbrough; ULVERSTON (BARROW); PORTSMOUTH; CARLTON (N.E.R.); and STOCKTON. Tar and Petroleum Distillers. Benzol and Petroleum Spirit, 700 and other Gravities specially prepared for Carburetting. SOLAR OIL for Gas Making Kerosene, &c.
Correspondence invited.
Telegraphic Address: "Sadler, Middlesbrough."

NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E. and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE. Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

ECONOMY IN PURIFICATION.

INCREASE the Efficiency of your PURIFIERS by adopting CRIPPS'S PATENT BYE-PASS VALVE in the lower Tiers of Sieves. Practical Experience proves their Economy. Engineers are repeating orders after thorough trial.
References and Particulars can be obtained from the Makers—
C. & W. WALKER, Midland Iron-Works, Donnington, near Newport, SALOP.
And J. EVERY & SON, Phœnix Iron-Works, LEWES.

WANTED, a Main and Service Pipe LAYER, who can fix Meters and take Indices. A permanent Situation for a suitable Man.
Apply, by letter (enclosing *copies* of Testimonials, and stating Wages required), to the MANAGER, Gas-Works, REDDITCH.

SERVICE LAYER WANTED.

WANTED, immediately, a steady reliable FITTER as Outdoor Service Layer for a Gas Company in South Wales.
Apply, by letter, with Character, to No. 2787, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS-METER MANUFACTURERS.

WANTED, Gas-Meter Makers to supply METERS, Wet and Dry, 3-Light, in quantities, and fix thereon ready-made PATENT ATTACHMENTS of simple mechanism. Large and regular orders waiting. Arrangements can be made to mutual advantage.
Apply, by letter, to No. 2788, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS TAR and Ammoniacal Liquor Wanted.
Apply to JOSIAH HARDMAN, Milton, STAFFS.

WANTED, to purchase Gas Carbon delivered at nearest Station to Gas-Works, in quantities of not less than 4 tons.
Address, stating Price per ton and quantity, No. 2772, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also COMPLETE WORKS equal to 7000, 20,000, 60,000 cubic feet per diem. **Inquire and compare Prices and Particulars before ordering elsewhere.**
J. F. BLAKELEY, Gas Engineer, Ravensthorpe, YORKS.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. Sample and Price on application.
OXIDE PAINTS, OILS, SULPHURIC ACID, &c.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore. Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c. CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special Attention to Repairs.
Before placing Orders, please write for Estimate.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEWBATTLE, DALKEITH, } SCOTLAND.

SULPHATE OF AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

In Paper Covers, Post Free 2s.

STEPHEN CARPENTER, late of the Bow Common Gas-Works, on the PURIFICATION OF COAL GAS BY LIME, &c., and the Method of Working Lime Purifiers so that the Lime may be used a second time, with a Description of a short Method of Working the Sulphur Test.
S. CARPENTER, "Ryde," Woodhouse Grove, East Ham, ESSEX; or of H. W. CARPENTER, 3, Bedford Villas, Carshalton, SURREY.

GAS, Water, and Electric Lighting, The LAW OF. By MICHAEL and WILL. Fourth Edition. Re-written and brought down to September, 1894, by J. SHIRESS WILL, Q.C., Esq. *Royal 8vo. Price 32s., Cloth; for Cash, Post Free, 26s. 6d.*
"Pains have been taken to treat more fully many subjects of constantly recurring importance to those concerned—such as the Law relating to the Breaking up of Streets, and the Maintenance therein of the various Appliances connected with the Water Supply, &c."—*Extract from Preface.*
BUTTERWORTH AND Co., 7, FLEET STREET, E.C.

FOR SALE—Four 8 feet square Purifiers, with 8-inch Connections and Centre-Valve, Lifting Gear, &c., complete. Also Four Sets of RETORT MOUNTINGS for 15-inch Round Retorts in Settings of Six. No reasonable offer refused.
Apply to H. WIMHURST, Gas-Works, SLEAFORD.

FOR SALE, cheap—
One Two-Lift GASHOLDER and CAST-IRON TANK, 64 ft. by 16 ft.; Capacity, 98,000 cubic feet.
One CAST-IRON TANK, 65 ft. by 16 ft.; Capacity, 331,800 gallons.
One TWO-LIFT GASHOLDER, 50 ft. by 16 ft.; Capacity, 63,000 cubic feet.
One CAST-IRON SCRUBBER, 38 ft. 6 in. by 6 ft. diameter.
EXHAUSTERS, 5000 to 60,000 cubic feet per hour.
We would undertake to re-erect any of the above, if desired.
Photos, Particulars, and Prices of above on application to SAML. WHILE AND SONS, 60, Queen Victoria Street, LONDON, E.C.

TENDERS FOR GAS COAL.

THE Directors of the Cork Gas Consumers' Company invite TENDERS for best GAS COAL in such quantities as they may require for One, Two, or Three Years. Deliveries to commence in April next.
Quotations to state Prices f.o.b. and c.i.f.
J. S. O'MAHONY,
Secretary
72, South Mall, Cork.

TENDERS are invited for Lighting the City of S. PAULO (BRAZIL) BY GAS, and must be sent under sealed covers, marked "Illuminaçao a Gaz da Cidade de S. Paulo," to the Secretaria da Agricultura, Commercio, e Obras Publicas (Department of Agriculture, Commerce, and Public Works), in time to reach the said Department not later than Three o'clock p.m., on April 30, 1897.
Particulars may be had on application, by letter, to the BRAZILIAN LEGATION, LONDON; or to the BRAZILIAN CONSULATES in LONDON, LIVERPOOL, or GLASGOW.

URBAN DISTRICT COUNCIL OF PADIHAM.
(GAS DEPARTMENT.)

THE Gas Committee of the above Council invite TENDERS for the supply of RETORTS, FIRE-BRICKS, &c.

For Particulars, apply to the undersigned.

Tenders, endorsed "Tender for Retorts, &c.," and addressed to the Chairman, Gas Committee, District Council Office, Padiham, must be sent in not later than Saturday, Jan. 30, 1897.

By order,
J. R. SMITH,
Clerk.

District Council Office,
Padiham, Jan. 16, 1897.

SHEPTON MALLET GAS AND COKE COMPANY.

THE Directors are prepared to receive TENDERS for the erection of a GASHOLDER of the capacity of about 33,000 feet, and also for the Excavation for, and Building a Tank for same. Estimates may be given for both Holder and Tank, or for Tank separate from Holder.

Plans and Specifications may be seen at the Offices of the Company, on application to the Superintendent; and Estimates must be sent in before Feb. 8.

The Directors do not pledge themselves to accept the lowest or any tender.

WM. CLARKE,
Superintendent.

Jan. 18, 1897.

HEBDEN BRIDGE AND MYTHOLMROYD GAS BOARD.

THE above Board are prepared to receive TENDERS for TELESCOPING their GASHOLDER at Mytholmroyd (118 feet diameter).

Plan and Specification can be seen on application to the undersigned, at the Gas-Works, Hebden Bridge, on and after Friday, Jan. 29, 1897.

Sealed tenders (endorsed "Tender for Gasholder") to be delivered not later than Saturday, Feb. 6, 1897, addressed to E. J. Crossley, Esq., Chairman, Gas-Works, Hebden Bridge.

The Board do not bind themselves to accept the lowest or any tender.

R. WEST,
Manager.

Gas-Works, Hebden Bridge,
Jan. 25, 1897.

BOROUGH OF WIDNES.

THE Widnes Corporation are prepared to receive TENDERS for the supply of FIRE-CLAY, CLAY RETORTS, BLOCKS, and BRICKS.

Specifications and Forms of Tender may be obtained from Mr. Isaac Carr, Assoc.M.Inst.C.E., Gas-Works, Widnes.

Tenders, endorsed "Fire-Clay Goods," to be addressed to the Chairman of the Gas Committee, and delivered to the undersigned not later than the 1st of February prox.

The Corporation do not bind themselves to accept the lowest or any tender.

H. S. OPPENHEIM,
Town Clerk.

Town Clerk's Office, Widnes,
Jan. 21, 1897.

CORPORATION OF LEICESTER.

RETORT-FITTINGS, HYDRAULIC MAIN, &c.
SECTION No. 2—CONTRACT No. 36.

THE Gas and Electric Lighting Com- mittee are prepared to receive TENDERS for the supply of RETORT-FITTINGS, HYDRAULIC MAIN, &c., at their Aylestone Road Works.

Drawings may be seen, and Specification and Form of Tender obtained, upon application to the Engineer, and on payment of the sum of £5, which amount will be returned upon receipt of a *bonâ-fide* tender.

Tenders, addressed to Alderman Lennard, Chairman, and endorsed "Tender for Retort-Fittings, &c.," to be delivered at these Offices not later than Eleven o'clock a.m., on Saturday, Feb. 6, 1897.

The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, M.Inst.C.E.,
Engineer and Manager.

Offices: Millstone Lane,
Leicester, Jan. 23, 1897.

CORPORATION OF LEICESTER.

RETORTS AND FIRE-BRICKS.
SECTION No. 2—CONTRACT No. 38.

THE Gas and Electric Lighting Com- mittee of the above Corporation are prepared to receive TENDERS for the supply and delivery of RETORTS and FIRE-BRICKS.

Specification, Quantities, and Form of Tender can be obtained from the Engineer.

Tenders, addressed to Alderman Lennard, Chairman, and endorsed "Tender for Retorts, &c.," to be delivered at these Offices not later than Eleven o'clock a.m., on Saturday, Feb. 6, 1897.

The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, M.Inst.C.E.,
Engineer and Manager.

Offices: Millstone Lane,
Leicester, Jan. 23, 1897.

Limp Cloth; price 2s., free by post.

TABLES
OF
Values, Discounts, Dividends, and Weights and Measures,
FOR USE IN GAS OFFICES.
REPRINTED FROM
"NEWBIGGING'S HANDBOOK."

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

MANCHESTER CORPORATION GAS-WORKS.

TO CONTRACTORS.

TENDERS are invited for Steel and IRON WORK, to be erected in No. 1 Retort-House, in connection with an Installation of Inclined Retort Settings, at the Gaythorn Gas-Works.

Drawings may be seen, and general Conditions of Contract, Specification, and Bill of Quantities obtained, on application (in writing only) to Mr. C. Nickson, Superintendent of the Gas Department, Town Hall.

Tenders, endorsed "Tender for Steel and Iron Work," and addressed to the Chairman of the Gas Committee, to be delivered at the above Office not later than Ten a.m., on Friday, the 5th of February prox.

The Corporation do not bind themselves to accept the lowest or any tender.

(Signed) WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
Jan. 22, 1897.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that a HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors in this Company will be held at this Office on Friday, the 5th day of February next, at Twelve o'clock (noon) precisely, to transact the usual Business, including the declaration of a Dividend for the Half Year ending on the 31st day of December last, and to elect Directors and Auditors in the place of those who will at such Meeting go out of Office in compliance with the Company's Acts or Schemes of Amalgamation.

By order,
JOHN WILLIAM FIELD,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., Jan. 19, 1897.

SOUTH METROPOLITAN GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Bridge House Hotel, London Bridge, in the Borough of Southwark, on Wednesday, the 17th day of February next, at Two o'clock in the afternoon precisely, to receive the Directors' Report, and the Accounts of the Company for the Half Year ended the 31st of December last; to declare a Dividend; and to elect two Directors and one Auditor in the place of those retiring by rotation.

NOTICE IS HEREBY ALSO GIVEN, that at such Meeting the Directors will submit a RESOLUTION to the Proprietors FOR AUTHORITY TO RAISE £250,000 FURTHER CAPITAL by the creation and issue of Ordinary Stock and Debenture Stock, pursuant to the Powers contained in the Company's Acts of 1882 and 1896.

The TRANSFER BOOKS WILL BE CLOSED from the 3rd day of February, until after the Meeting.

FRANK BUSH,
Secretary.

Offices: 709A, Old Kent Road, S.E.,
Jan. 23, 1897.

HORNSEY GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY GENERAL MEETING of the Shareholders of this Company will be held at the Offices of the Company, No. 63, Chancery Lane, in the County of Middlesex, on Friday, the 19th day of February, 1897, at Three o'clock in the afternoon precisely, to receive a Report from the Directors, declare Dividends, elect two Directors and one Auditor, and transact the Ordinary Business of a General Meeting.

The TRANSFER BOOKS WILL BE CLOSED on the 5th of February until after the General Meeting.

By order of the Board,
S. J. WILLIAMS,
Secretary.

Offices: 63, Chancery Lane, London, W.C.,
Jan. 25, 1897.

BARNET DISTRICT GAS & WATER COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of the above Company will be held at the Albion Tavern, Aldersgate Street, in the City of London, on Friday, the 26th day of February, 1897, at Half-past Twelve o'clock in the afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 31st day of December last, to declare a Dividend, to Elect Directors and an Auditor, and to transact the General Business of the Company.

The TRANSFER BOOKS WILL BE CLOSED from the 18th to the 26th of February, both inclusive.

By order of the Board,
ALFRED LASS,
Secretary.

Offices: 30, Gracechurch Street,
London, Jan. 22, 1897.

CHELSEA WATER-WORKS COMPANY.

2¾ PER CENT. DEBENTURE STOCK.
MINIMUM PRICE: £98 PER CENT.
ISSUE OF AN AMOUNT TO REALIZE £50,000.

NOTICE is Hereby Given, that the Directors are prepared to receive TENDERS for the above ISSUE, being the whole of the amount created and authorized under the Chelsea Water-Works Act, 1896, bearing Interest at 2¾ per cent. per annum, and Redeemable after the expiration of 25 Years from the date of issue, subject to Six Months' Notice being given by the Company.

Minimum Price: £98 per cent.

Tenders must be delivered at the Company's Office, No. 41, Commercial Road, Pimlico, S.W., not later than Eleven a.m., on Thursday, the 25th of February next.

Particulars and Conditions of Sale, together with Forms of Tender, may be obtained at the said Office, or will be forwarded on application.

By order of the Court of Directors,
G. H. GILL,
Secretary.

41, Commercial Road, Pimlico,
Jan. 14, 1897.

LLANDUDNO URBAN DISTRICT COUNCIL.

TO GAS-WORKS CONTRACTORS.

THE Llandudno Urban District Council invite PLANS and TENDERS for the erection of a NEW RETORT-HOUSE, with other Works at their Gas-Works at Llandudno.

Plan of Site with other Particulars may be obtained from Mr. E. P. Stephenson, the Engineer to the Council, upon payment of 10s. 6d., which will not be returned.

Tenders, endorsed "Retort-House," must be sent in to the undersigned on or before Tuesday, the 2nd day of February.

The Council do not bind themselves to accept the lowest or any tender.

A. CONOLLY,
Clerk to the Council.

Council Offices, Llandudno,
Jan. 18, 1897.

SOUTHAMPTON GASLIGHT AND COKE COMPANY.

ISSUE OF 5 PER CENT. DEBENTURE STOCK.
SALE BY TENDER.
MINIMUM PRICE: £155 PER CENT.

THE Directors invite Tenders for £5000 of DEBENTURE STOCK, authorized to be raised under the Southampton Gas Act, 1876, which will bear a fixed and perpetual preferential rate of Interest of Five Pounds per cent. per annum, payable half-yearly (subject to Income-Tax).

Allotments to the highest bidders.

Tenders must be delivered on or before Tuesday, the 2nd of February, 1897.

Forms of Tender, with Particulars and Conditions, may be obtained on application to the SECRETARY, at the Company's Offices, Ogle Road, SOUTHAMPTON, or from the Company's Bankers, Messrs. GRANT AND MADDISON'S UNION BANKING COMPANY, LIMITED SOUTHAMPTON; or from Messrs. LLOYD'S BANK, LIMITED Lombard Street, LONDON.

By order of the Directors,
C. CROWTHER SMITH,
Secretary.

Southampton, Jan. 23, 1897.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Powers.

He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.

Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards.

Offices: 18, FINSBURY CIRCUS, E.C.

By Order of the Directors.

IMPORTANT ISSUE OF £10,000 STOCK OF THE BRIGHTON AND HOVE GENERAL GAS COMPANY.

MR. ALFRED RICHARDS will Sell by AUCTION, at the Mart, E.C., on Wednesday, Feb. 10, at Two precisely, in lots of £100 each,

£10,000 OF "A" ORDINARY STOCK
OF THE
BRIGHTON AND HOVE GENERAL GAS COMPANY,

ranking for a Standard Dividend of 7 per cent., subject to the Sliding Scale; the last Dividend on the Company's "A" Stock having been 8¼ per cent. per annum.

Particulars of the SECRETARY of the Company, at No. 5, GREAT WINCHESTER STREET, E.C., and 77, West Street, BRIGHTON; of Messrs. HOWLETT AND CLARKE, of 8, Ship Street, BRIGHTON, Solicitors to the Company; of Mr. RALPH HOMAN, Stock and Share Broker, 2, Austin Friars, LONDON, E.C.; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to
THE WALLSEND & HEBBURN COAL COMPANY, LTD.
8 Lombard Street,
NEWCASTLE-ON-TYNE.

W. RICHARDSON, Fitter.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road
CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers and rendering leakage impossible.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE:

90, CANNON STREET, E.C.

HOLMSIDE GAS COALS.

PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation.

Yield of Gas Per Ton. . 11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton. . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . 13½ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash. . . . . 1·34 Per Cent.
Tar. . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE AND SOUTH MOOR OFFICES,

NEWCASTLE-UPON-TYNE.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED,

— *v* —

"DE MARE" COMPANY.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED.

— *v.* —

"SUNLIGHT" COMPANY.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED, HEREBY GIVE NOTICE, as follows:—

VALIDITY. The Company's Patent has been declared VALID ON ALL POINTS after a Fifteen-Day Trial.

NATURE OF INVENTION. The Invention was described by Mr. Justice Wills as a "PIONEER INVENTION."

SCOPE OF PATENT. The Patent HAS BEEN GIVEN A WIDE CONSTRUCTION; and it was held that the protection given by it was not confined to Mantles manufactured according to the particular prescriptions set out in the Specification.

SHAPE OF MANTLE. The Judge held that a Mantle, even if made in a different form or shape (such as the "De Mare" Fringe or Plume), IS STILL AN INFRINGEMENT of the "Welsbach" Patent.

"DE MARE" JUDGMENT. Judgment for an INJUNCTION, WITH FULL COSTS, has been given against the "De Mare" Incandescent Gas-Light System.

"SUNLIGHT" JUDGMENT. Judgment was given AGAINST the "Sunlight" Incandescent Gas-Lamp Company, Limited, on the question of the VALIDITY OF THE PLAINTIFFS' PATENT.

"SUNLIGHT" MANTLES. Last about 100 hours.

"WELSBACH" MANTLES. Last about 1000 hours.

"Sunlight" Mantles BURN DOUBLE THE GAS to produce the same candle power as the Incandescent Gas-Light Company's Mantles.

Users of "Sunlight" Mantles are applying to the Incandescent Gas-Light Company to REPLACE THEM BY THEIR OWN MANTLES.

WARNING. Users of the Incandescent Gas-Light Company's Mantles upon "Sunlight" Burners ARE INFRINGERS OF THE COMPANY'S PATENT, AND WILL BE AT ONCE PROCEEDED AGAINST.

COSTS. Certificates of the Validity of the Company's Patent have been granted both by Mr. Justice Romer and Mr. Justice Wills entitling the Company to Solicitor and Client Costs, which will, IN ALL CASES, BE RIGOROUSLY ENFORCED.

INFRINGERS. The Incandescent Gas-Light Company WILL TAKE PROCEEDINGS AGAINST ALL PERSONS INFRINGING THEIR PATENT WHETHER

MAKERS,
WHOLESALE DEALERS,
RETAILERS,
or
USERS.

Users of the Company's Mantles upon Burners not sold by the Company ARE INFRINGERS.

"LIMITED LICENSE" WARNING. Judgments have already been obtained against such users from Mr. Justice Chitty, Mr. Justice Stirling, Mr. Justice Kekewich, and Mr. Justice North.

FAITHFULL & OWEN,
11, Victoria Street,
Westminster.

Solicitors to the Incandescent Gas-Light Company, Limited.

April, 1896.

COKE-BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT)

New Design, with two Cutting Rollers, making less Breeze than their old pattern.

GEORGE WALLER & CO.,

165, QUEEN VICTORIA STREET, E.C.,

And at STROUD, GLOUCESTERSHIRE.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,

SEAHAM HARBOUR, COUNTY OF DURHAM.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 84, OLD BROAD ST., E.C.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD
BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY
RAVENSTHORPE, NEAR DEWSBURY.

THORNLEY GAS COALS
WORKED BY THE
WEARDALE IRON & COAL Co., Ld.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton	10,500 Cub. Ft.
Illuminating Power	16·9 Candles.
Coke (of good quality)	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the
WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

STAFFORDSHIRE THE TUBE Co. Ltd.

TELEGRAMS:
"EVESON, BIRMINGHAM."

BOLDON GAS COALS.
Worked by THE HARTON COAL CO., LTD.
Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For Prices, &c., apply to the
HARTON COAL COMPANY,
LIMITED,
Newcastle-on-Tyne.
W. H. PARKINSON,
FITTER.

THE "COOMBE" DRAUGHT SCREEN
FOR INCANDESCENT BURNERS.
For Illustration and Statement of Advantages to be gained by its use, see "JOURNAL," Jan. 5, p. 46,
ALFRED ARCULUS & CO., Glass Manufacturers,
BIRMINGHAM.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
CANNEL & COAL.

TYNE
BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C.

R. & A. MAIN,
GAS COOKING AND HEATING STOVES,
92, ALDERSGATE STREET, KINNING PARK,
LONDON, E.C., & GLASGOW.

MOBBERLEY & PERRY
STOURBRIDGE.
Manufacture & supply best quality of
Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)
Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.
FIRE BRICKS, LUMPS, & TILES, BLUE STAFFORDSHIRE VITRIFIED BRICKS FOR PAVING, &c., &c.
EVERY REQUISITE FOR GAS-WORKS. Retort Setters sent to any part of the Kingdom.
Contractors for the erection of Retort-Benches complete.
London Agents:
BALE & HARDY, Gas Engineers and Contractors,
BRIDGE HOUSE, 181, QUEEN VICTORIA STREET, E.C.

GAS COAL.

BEST
REAL OLD SILKSTONE GAS COAL,
Address THE STRAFFORD COLLIERIES COMPANY,
Near BARNSLEY, SOUTH YORKSHIRE.

JAMES MILNE & SON, LTD.,

GAS ENGINEERS,
MILTON HOUSE WORKS, EDINBURGH.
LONDON. — GLASGOW. — LEEDS.

JOHN BROWN & CO., LTD., SHEFFIELD.

Proprietors of

ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

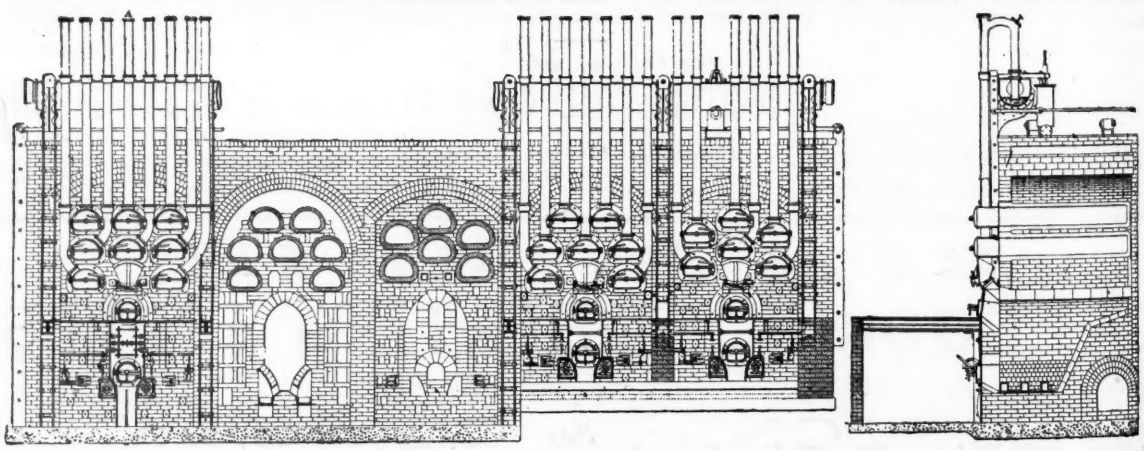
ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.
Value in Pounds of Sperm, 820·80.

VERY FREE FROM IMPURITIES.

TELEGRAMS: "ATLAS, SHEFFIELD."

HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE POSITIVELY UNRIVALLED IN PRODUCTIVE CAPACITY, DURABILITY, AND SIMPLICITY OF MANAGEMENT. RETORTS OF ORDINARY DIMENSIONS CARBONIZING FROM 18 TO 24 CWT. OF ENGLISH AND 21 TO 26 CWT. OF SCOTCH COAL PER 24 HOURS, DEPENDING UPON THE NATURE OF THE COAL, AND PRODUCING UP TO FULLY 13,000 CUBIC FEET PER MOUTHPIECE IN THE SAME TIME, AND WITH THE SMALLEST EXPENDITURE OF FUEL ATTAINABLE, AND RETURNING IN PROFIT THE ENTIRE COST OF ERECTION WITHIN TWELVE TO EIGHTEEN MONTHS; AND THUS REDUCING TO INSIGNIFICANCE THE INCREASED COST OF THESE SETTINGS OVER THE COMMON OR GENERATOR FURNACE SYSTEMS.

THESE SETTINGS ARE EXTENSIVELY ADOPTED, AND ARE ERECTED UPON THE SHALLOW AND STAGE FLOOR PLANS. THEY ARE ADAPTED TO ANY EXISTING ARRANGEMENTS, AND PERFECT SATISFACTION GUARANTEED. THE COMPOSITION OF FIRE-RESISTING AND OTHER SPECIAL FIRE-CLAY MATERIALS FURNISHED IS OF THE HIGHEST ORDER; AND THE SYSTEM AS A WHOLE, AS NOW PERFECTED, IS THE RESULT OF LONG EXPERIENCE AND CAREFUL STUDY OF THE PRINCIPLES OF GASEOUS FIRING.

Drawings and Tenders are furnished for the complete erection of Benches, including Retort and Bench Mounting of the most modern and approved description; or existing Ovens fitted up with the Patentee's arrangements.

Full Particulars may be had on application to the Patentee's Agents: **Messrs. JONAS DRAKE AND SON**, Retort Setters and General Carbonizing Engineers, Ovenden, Halifax, Yorkshire, Sole Agents for England, Wales, and Foreign Countries; **C. M. HAMILTON**, Retort Setter and Contractor, 5, Stuart Street, Shawlands, Glasgow, Agent for Scotland and Ireland; and to the Principal Agent, **R. F. HISLOP** (Son of Patentee), General Constructing and Carbonizing Engineer, Gas-Works, Paisley, N.B.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine qua non*

TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED AND AFFORDING THE HIGHEST SATISFACTION.

The Patentee's SELF-SEALING CAPS FOR THE TOP OF ASCENSION-PIPES, and his "SPECIAL" FLUE PORT BOXES, are most important additions to his Carbonizing Plant.

SPENT LIMES NO LONGER WASTE PRODUCTS.

Under C. R. HISLOP'S Patents, all Spent Limes are effectively recovered at from one-third to one-half the cost of New Lime.
Further Information and Pamphlets from Principal Agent.

ALEX. C. HUMPHREYS, M.Inst.C.E. A. G. GLASGOW, M.E.

MESSRS. HUMPHREYS & GLASGOW

Have constructed their EUROPEAN type of

CARBURETTED WATER-GAS PLANT

At the following Gas-Works:—

Copenhagen	700,000 Cub. Ft.	Preston	1,500,000 Cub. Ft.
Belfast	1,700,000 ,,	Southport	750,000 ,,
Belfast (Second Contract)	4,500,000 ,,	Bath	1,000,000 ,,
Glasgow	300,000 ,,	New York	1,200,000 ,,
Brussels	700,000 ,,	Newburgh, N.Y.	350,000 ,,
Brussels (Second Contract)	700,000 ,,	St. Joseph, Mo.	750,000 ,,
Liverpool	3,500,000 ,,	Winchester	200,000 ,,
Tottenham	750,000 ,,	Hoylake	125,000 ,,
Tottenham (Second Contract)	750,000 ,,	Shanghai	225,000 ,,
Santiago	400,000 ,,	Holyoke, Mass.	600,000 ,,
Swansea	750,000 ,,	Stockport	500,000 ,,
Brighton	1,500,000 ,,		

And have now under Contract:—

Manchester	3,000,000 Cub. Ft.	Bordentown, N.J.	125,000 Cub. Ft.
Edinburgh	2,000,000 ,,	Lea Bridge	350,000 ,,
Stockton-on-Tees	500,000 ,,	Newburgh, N.Y. (Second Contract)	250,000 ,,
Norwich	1,000,000 ,,	Coventry	600,000 ,,
Guildford	350,000 ,,	Brentford	1,100,000 ,,
Syracuse, N.Y.	850,000 ,,		

In addition to which the previous Installations of The Gaslight and Coke Company under this System have a total capacity of 10,000,000 cubic feet per diem.

9, Victoria Street, London, S.W. Telegrams: "EPISTOLARY, LONDON." *United States Office, 64, Broadway, New York.*

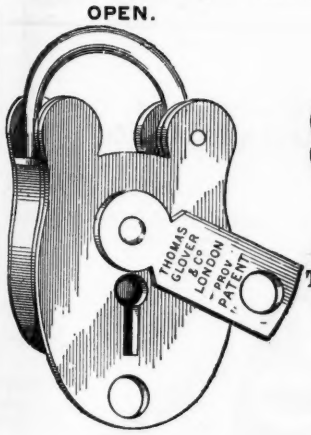
[ESTABLISHED 1844.] ORIGINAL MAKERS. [ESTABLISHED 1844.]

LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;

The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.

OPEN.



THOMAS GLOVER & CO.'S

PATENT

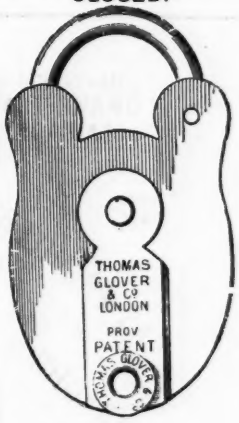
SECURE PADLOCK

Prevents Tampering with the

CASH-BOXES OF PREPAYMENT METERS.

The Padlock is Sealed by means of a Lead Eyelet, which is impressed with Company's private mark. Eyelets easily fixed and removed by Company's Collector.

CLOSED.



Telegraphic Address: "GOTHIC LONDON." Telephone No. 6725.

THOMAS GLOVER & CO., LTD.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

BRISTOL: 62, VICTORIA STREET. *Telegraphic Address: "GOTHIC."*

BIRMINGHAM: 1, OOZELLS STREET. *Telegraphic Address: "GOTHIC."*

MANCHESTER: 37, BLACKFRIARS STREET. *Telegraphic Address: "GOTHIC."*

HARPER & MOORES,
STOURBRIDGE.

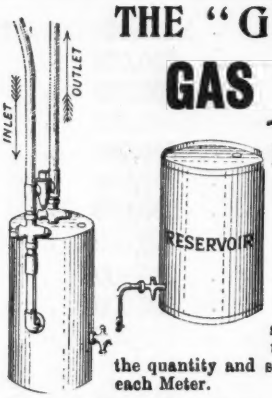
MANUFACTURERS OF
BEST FIRE-BRICKS, GAS-RETORTS,
LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.
Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.

MANUFACTURERS OF GLASSHOUSE POTS AND CRUCIBLES OF EVERY KIND.
ESTABLISHED 1836.

STOURBRIDGE
RETORTS AND FIRE-BRICKS.

BEST QUALITY.

KING BROTHERS, STOURBRIDGE.
[See Illustrated Advertisement, Jan. 5, p. 46.]



THE "GLOBE" PATENT
GAS ENRICHER.

IMPROVED LIGHT AND REDUCED GAS BILLS.

ESTIMATES AND TERMS ON APPLICATION.

When writing for Estimates, please state number of Meters in use, with the diameter of the Outlet-Pipe. Also the quantity and sizes of the ordinary Burners served by each Meter.

GLOBE GAS ENRICHER SYNDICATE, LTD.,
81, HIGH HOLBORN, LONDON, W.C.

INCANDESCENT GAS LIGHTING

SMOKELESS GLOBE-CHIMNEY.

CONSUMES ITS OWN SMOKE, AND INCREASES THE LIFE OF MANTLES.

No Chimney Required.

Prices 2s. 6d. to 4s. 0d.
List on Application.

J. ORMEROD,
81, HIGH HOLBORN, LONDON, W.C.

HANNA, DONALD, & WILSON,

(Established 1851),

GAS ENGINEERS & CONTRACTORS,
Abercorn Foundry and Abbey Works,
PAISLEY, N.B.,

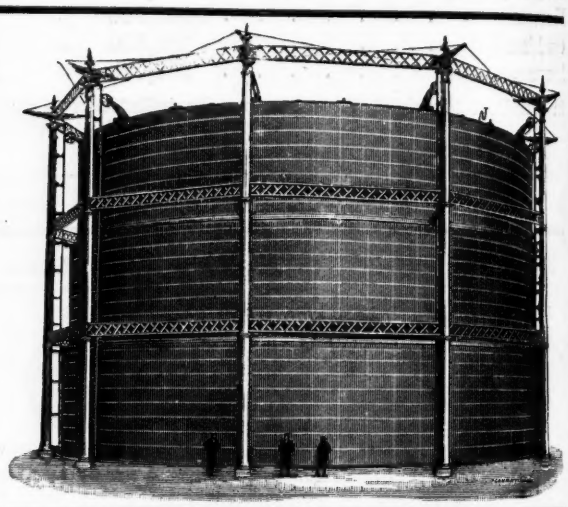
MAKERS OF

Gasholders and Gas Plant

OF EVERY DESCRIPTION.

Sole Agents for Scotland for the Automatic Coal-Gas Retort (Inclined System) Company, Limited.

Telegraphic Address: "Donald, Paisley."



LONDON OFFICE
60, QUEEN VICTORIA ST. E.C.

TELEGRAPHIC ADDRESSES
"DRAKESON HALIFAX."
"ECLAIRAGE LONDON."

TELEPHONE No 43.
"HALIFAX EXCHANGE"

GAS ENGINEERS.
CONTRACTORS.
IRONFOUNDERS.

JONAS DRAKE & SON

SOLE AGENTS FOR
HISLOP'S
PATENT REGENERATIVE FURNACES
—FOR—
ENGLAND, WALES & ABROAD.
RETORT BENCHES ERECTED COMPLETE WITH OR WITHOUT SPECIAL FURNACES.
RESULTS GUARANTEED.

OVENDEN HALIFAX

RETORT SETTERS.
FURNACE BUILDERS.
ETC. ETC.

Designs and Estimates on Application.

GASEOUS FIRING A SPECIALTY.

THE NEW INCANDESCENT (SUNLIGHT PATENT) GAS LIGHTING COMPANY, LIMITED.

THE SUNLIGHT COMPANY having finally beaten the Welsbach Company in the Law Courts, notwithstanding the misleading statements which are being advertised, the Legal Position of its Mantle is now

ESTABLISHED BEYOND ALL QUESTION.

Mr. JUSTICE WILLS says in his Judgment: "No use is made by the Defendants (the Sunlight Company) of any of the rare earths; and their choice of substances, and their method of applying the illuminants, appear to me to be as wide asunder as the poles from those contemplated by Welsbach."

Therefore any interference with our Customers by the Incandescent Company in the use of our Mantles, either on our Burners *or on theirs*, should be promptly reported. **It will at once be summarily dealt with by us, without cost to our Customers.**

THE SUNLIGHT MANTLE gives a SOFT MELLOW LIGHT, VERY AGREEABLE TO THE EYESIGHT, AND HEIGHTENS THE DECORATIVE EFFECT OF PLEASANT COLOURS.

WE ARE PREPARED TO MAINTAIN ALL BURNERS FITTED BY OURSELVES AT A VERY LOW PRICE PER ANNUM;

AND SPECIAL TERMS FOR RENEWAL MANTLES WILL ALSO BE MADE TO THOSE WHO PREFER TO DO SO THEMSELVES.

THE NEW INCANDESCENT (SUNLIGHT PATENT) GAS LIGHTING COMPANY, LIMITED,

33 & 34, SHOE LANE, LONDON, E.C.

Price 6s., Bound in Cloth.

THE CHEMISTRY OF ILLUMINATING GAS.

By NORTON H. HUMPHRYS, Assoc. M.Inst.C.E., F.C.S.

This work contains chapters on: The Relative Cost of Light from Gas, Oil, and Candles; Products of Combustion; The Sulphur Question; The Composition of Illuminating Gas; Water Gas; Various Gas-Making Processes; Oil Gas; Properties of Fluid Hydrocarbons; Tar for Gas-Making; Destructive Distillation; Condensation; and Purification.

London: WALTER KING, 11, Bolt Court, Fleet St., E.C.

PETTIGREW'S PATENT

Sulphate of Ammonia Plant

ON THE CONTINUOUS SYSTEM

Is the newest in the Market, and is the outcome of practical experience in Sulphate Making.

Old Systems easily and cheaply converted.

ANY SIZE ERECTED COMPLETE AT HOME OR ABROAD.

Write for Particulars, Testimonials, and References to

GEO. PETTIGREW & Co.,

GAS AND CHEMICAL ENGINEERS,

MIDDLESBROUGH-ON-TEES.

ARROL-FOULIS

Patent Automatic Machinery

FOR

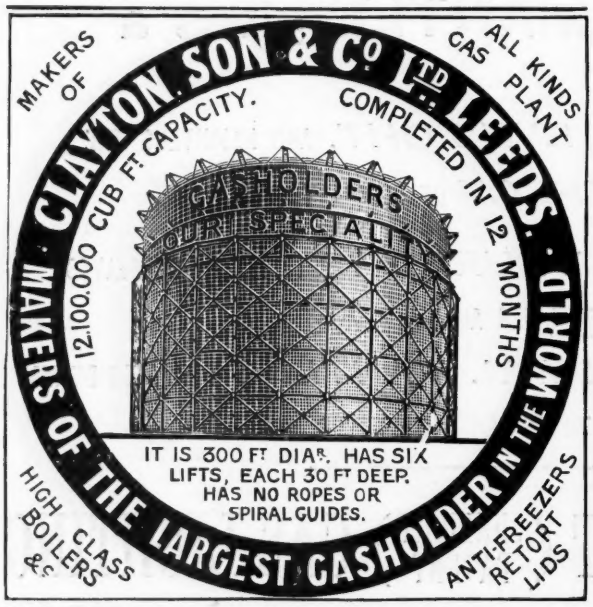
DRAWING AND CHARGING GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers,

SIR WILLIAM ARROL & CO., Limited,

GLASGOW.

[See Illustrated Advertisement, Jan. 5, p. 53.]


MAKERS OF
CLAYTON, SON & Co LTD LEEDS.
ALL KINDS GAS PLANT
12,100,000 CUB FT CAPACITY.
COMPLETED IN 12 MONTHS
GASHOLDERS
OUR SPECIALITY
IT IS 300 FT DIAM. HAS SIX LIFTS, EACH 30 FT DEEP. HAS NO ROPES OR SPIRAL GUIDES.
MAKERS OF THE LARGEST GASHOLDER IN THE WORLD
HIGH CLASS BOILERS &c
ANTI-FREEZERS RETORT LIDS

GIRDERS, ROOFS, & ALL KINDS OF STRUCTURAL IRONWORK.

London Office: 60, QUEEN VICTORIA STREET, E.C.

Telegraphic Addresses: "GAS, LEEDS," "ECLARAGE, LONDON."

BOWENS' Ltd. Successors,

STOURBRIDGE.

MANUFACTURERS OF

BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.

Established 1860.

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS, Near LEEDS,

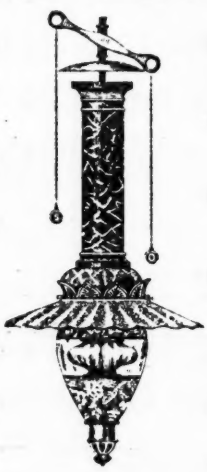
Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

The Climax of Regenerative Gas Lighting!!



THE

"VERTMARCHE"

A 280-CANDLE POWER PLAIN IRON LAMP,

CLASS A— **55/-**

LIGHT for LIGHT less than half the price of any other Regenerative Lamp.

Manufactured in England.

HENRY GREENE & SONS,

153 & 155, CANNON STREET, LONDON BRIDGE, E.C.

PARTICULARS AND PRICES FREE. AGENTS WANTED.

PATENT TWISTED TAPER RYMERS & TAPS.

These **Patent Twisted Taper Rymers and Taps** are the best ever made for Gas and Water Service Connections. A true Hole and a correct Thread can be assured. They are easy to work, and will last much longer than straight grooved Taps and Rymers.

THOUSANDS ARE IN DAILY USE.

Also SCREWING-MACHINES, STOCKS and DIES (with Patent Twisted Dies), PIPE-TONGS, and other TOOLS.

Apply for Prices and Particulars to

JOHN RUSCOE,

ALBION WORKS, HYDE, near MANCHESTER.

GODDARD, MASSEY, & WARNER'S

IMPROVED

Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES, APPLY TO

GODDARD, MASSEY, & WARNER,
ENGINEERS,
NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

BURT BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (FOUR APPARATUS).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations—

ILKESTON.
WIDNES.
HALIFAX.
ALTRINCHAM.
DENTON.
ST. ALBANS.
DUKINFIELD.
NORTHWICH.
HUDDERSFIELD.
BURY.
BRIGHOUSE.
MARKET HARBRO'
PRESCOT.
SOWERBY BRIDGE.
LEICESTER.
DARWEN.
NELSON.
ORMSKIRK.
CHORLEY.
WHITEHAVEN.
CHESTER.
SOUTH SHIELDS.
LEEK.
IPSWICH.
BOURNEMOUTH.
SALFORD.
LUTON.
HAMPTON COURT.

OXIDE OF IRON.

NATURAL BOG ORE FROM OWN MINES.

Samples and Prices on application.

WM. H. MÜLLER & CO.,

81, PALMERSTON BUILDINGS, LONDON, E.C.

TRADE MARK: "Compascum." Telegraphic Address: "FERRUM."

JOSEPH CLIFF & SONS,

INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,
WORTLEY, LEEDS.

LONDON OFFICES & DEPÔTS:

Baltic Wharf, Waterloo Bridge.
WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.

LIVERPOOL:
16, Lightbody Street.

LEEDS:
Queen Street.

MACHINE-MADE RETORTS

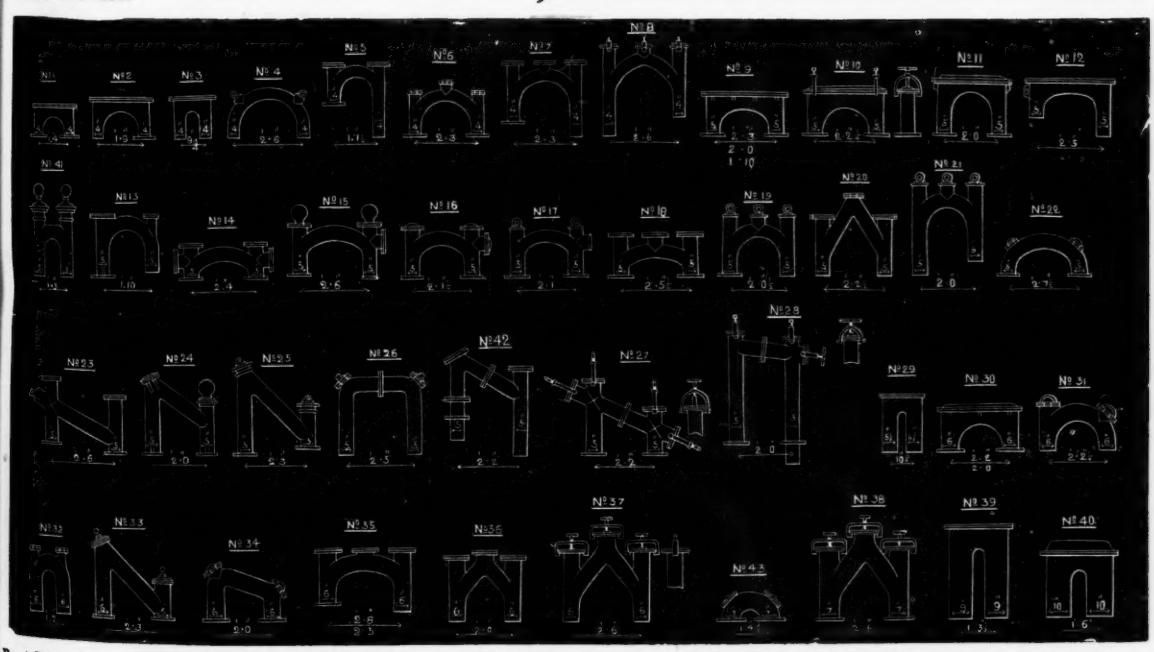
Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.
Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

R. & J. DEMPSTER, LTD., GAS PLANT WORKS,

Telegraphic Address: "SCRUBBER, MANCHESTER." National Telephone Nos. 54 and 2296.

NEWTON HEATH, MANCHESTER.



Part List of Stock Patterns for Arch and Bridge Pipes. The Majority of these Patterns can be altered to suit Special Requirements.

London Office: **181, Gresham House, Old Broad Street, E.C.**

PARKINSON'S

PREPAYMENT GAS-METERS.

Many Thousands in use in all parts of the Country.

COMBINE SIMPLICITY WITH STRENGTH.

ACCURACY WITH COMPACTNESS.

Adapted for use with PENNIES, SHILLINGS, or other English or Foreign Coins.

PRICE-CHANGING EFFECTED IN THE SIMPLEST MANNER AND WITH ABSOLUTE EXACTITUDE.

Coin Mechanism accessible, and easily taken apart in case of ill-usage, &c.

W. PARKINSON & Co.

Cottage Lane Works, City Road, LONDON.

Bell Barn Road Works, BIRMINGHAM.

Telegraphic Addresses {"INDEX, LONDON." "GAS METERS, BIRMINGHAM."

Telephone Numbers (National) {London 7778. Birmingham 1101.

[See also Advt. p. 172.

LONDON: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Jan. 26, 1897.